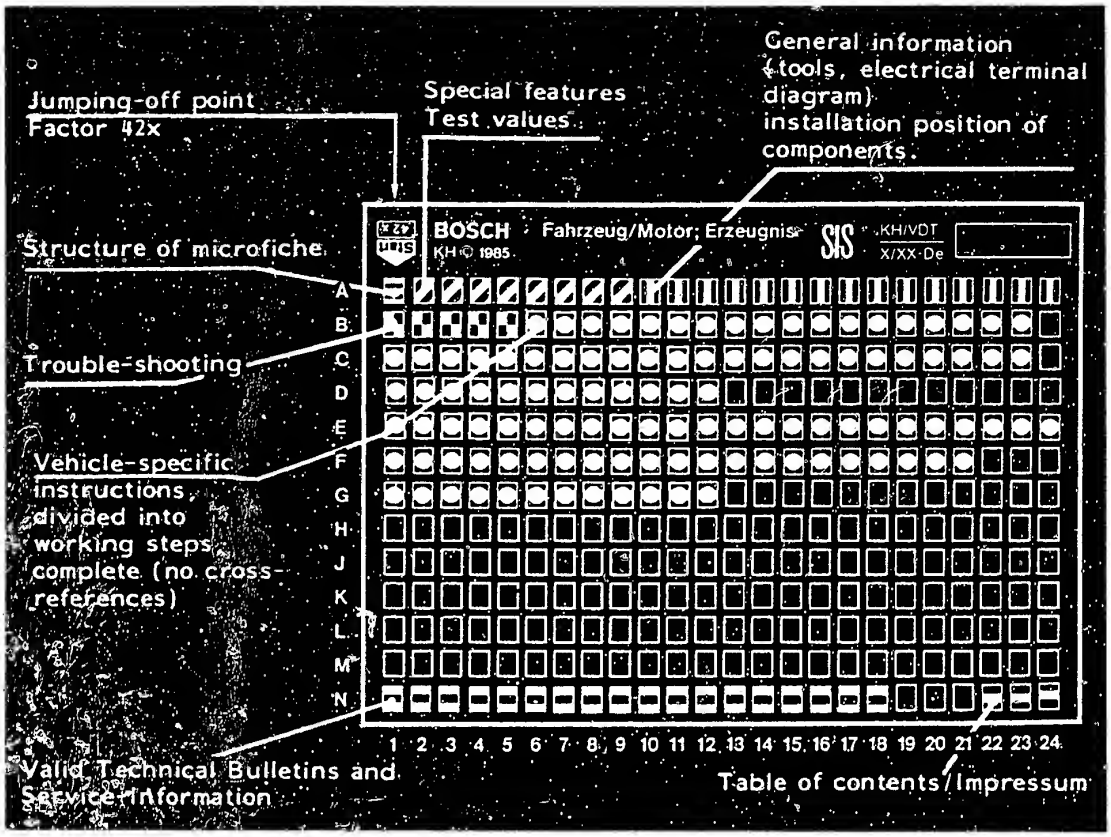
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step Vehicle/engine

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

The following vehicle models with 1.6...1.8 l/4-cylinder engines, with K-Jetronic are dealt with on this micro-card:

• Golf GTI	(6. 76→)	
• Scirocco GLI, GTI	(6. 76→)	
• Golf-Cabrio	(7. 79→)	Europe version
• Jetta LI, GLI	(7. 79→)	
• Jetta GT	(1. 84→)	
• Golf, Scirocco, Jetta	(7. 79→)	Sweden and Switzerland version

1. Special features

As of start of production
- Overpressure in fuel tank
- Non-return valve in inlet-union screw of fuel filter.

As of 1978 model
- Fuel distributor with push valve

As of 1981 model
- Fuel distributor with adjustable differential-pressure valves.

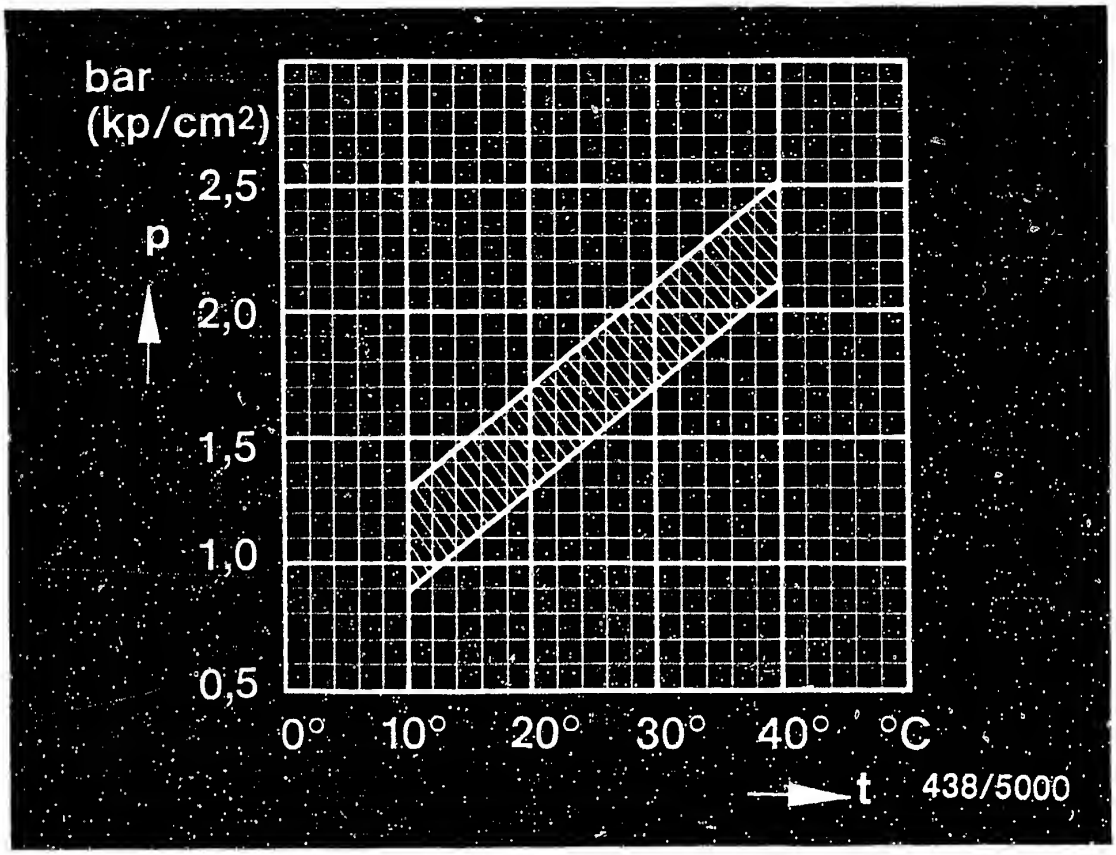
As of 1984 model
- Air-shrouded injection valves.
  Air distribution in cylinder head.
- Pre-supply pump in tank, tank pressureless.
- Additional small fuel tank with strainer.
- Minifilter in inlet-union screw of fuel-distributor inlet.

As of 1985 model
- Injection valves with fixed air-guide cap for air shrouding.
- In-tank electric fuel pump with screw-on pressure damper to reduce noise.
- Cold acceleration enrichment through start valve. Switched via throttle-valve switch, pressure-step switch and thermo-time switch.
- Idle valve 1 for engine-speed increase when idle speed drops below approx. 700 min^{-1}.
- Idle valve 2 for engine-speed increase with air conditioner on.

2. Test specifications

Test step	Test specifications
2.1 Electric fuel pump	**C1**
• Delivery: min. 750 cm³/30 s	
• Terminal voltage: min. 11.5 V under load	
• Delivery of pre-supply pump (if applicable). min. 1200 cm³/30 s	
2.2 Fuel distributor	**D4**
• Primary pressure	
Fuel distributor:	
0 438 100 005	Checking value 4.5...5.2bar (4.6...5.3kp/cm²)
	Setting value 4.7...4.9bar (4.8...5.0kp/cm²)
0 438 100 059 0 438 100 079 0 438 100 100	Checking value 4.7...5.4bar (4.8...5.5kp/cm²)
	Setting value 4.9...5.1bar (5.0...5.2kp/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and kp/cm² (gauge pressure).



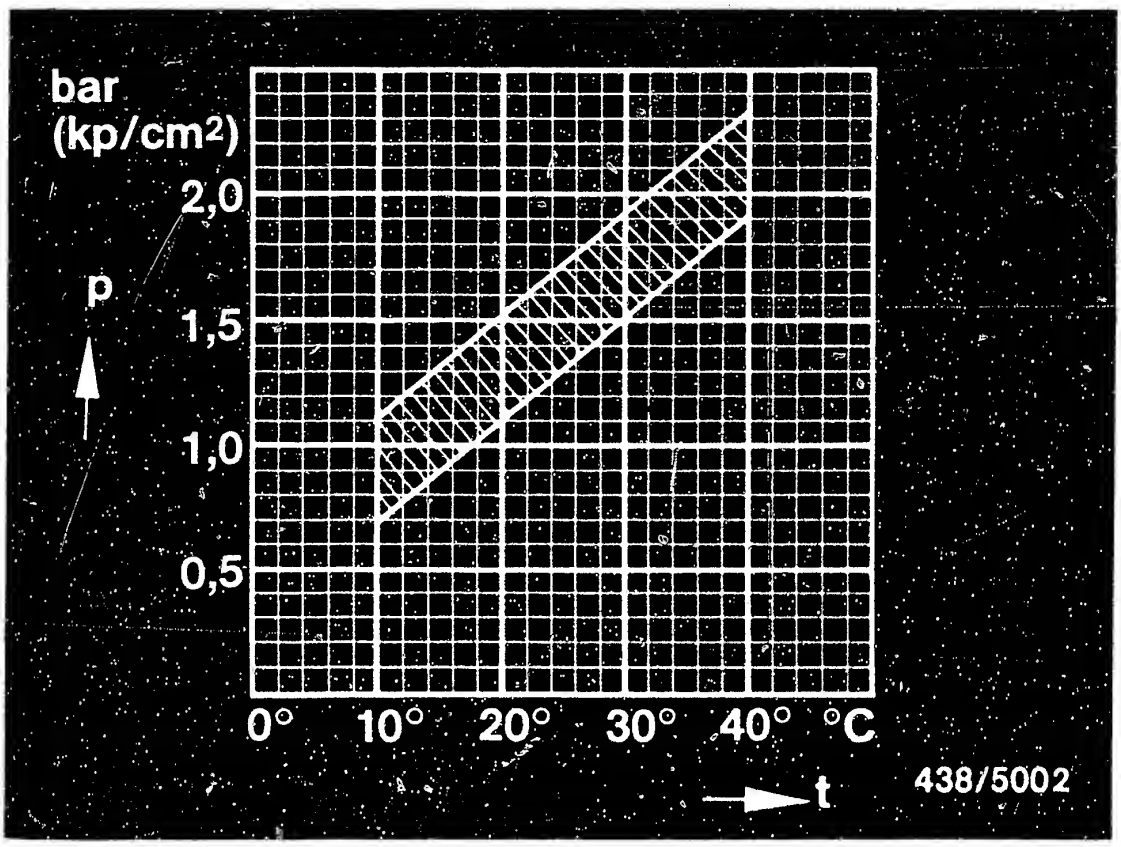
p = Control pressure (gauge pressure)
t = Ambient temperature

2.3 Control pressure "cold"

C12

- Warm-up regulator part number: 0 438 140 011

  Basic version of warm-up regulator



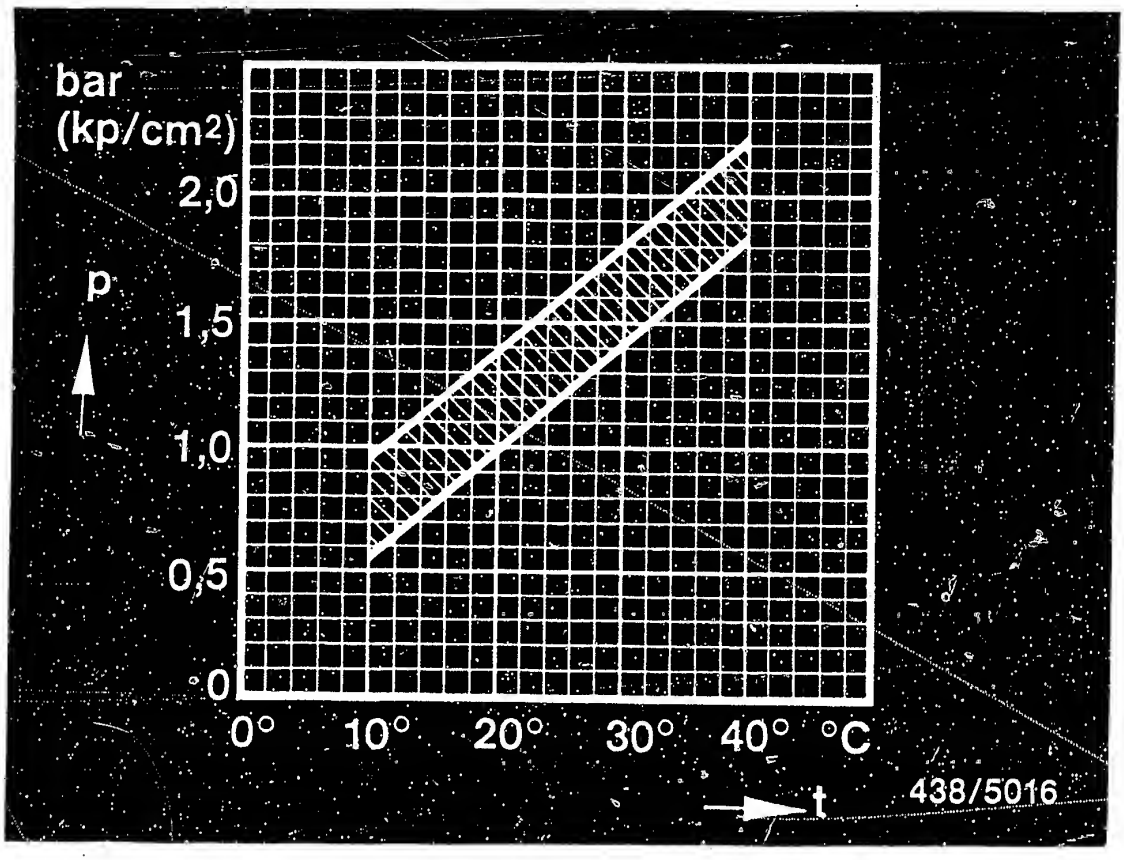
p = Control pressure (gauge pressure)
t = Ambient temperature

C12

Control pressure "cold"

- Warm-up regulator part number: 0 438 140 073
  0 438 140 074

  Basic version of warm-up regulator



p = Control pressure (gauge pressure)
t = Ambient temperature

C12

Control pressure "cold"

- Warm-up regulator part number: 0 438 140 118
  0 438 140 119

  Basic version of warm-up regulator

Test step	Test specifications
2.4 Control pressure "warm" Warm-up regulator 0 438 140 011 0 438 140 073 0 438 140 074 0 438 140 118 0 438 140 119	3.4...3.8bar(3.5...3.9kp/cm²)

C12

E1

2.5 Leak test

	for fuel accumulator part no. 0 438 170 027 / 0 438 170 028		0 438 170 010/011 / 0 438 170 019/020
	up to FD 931 (identified by blue dot)	as of FD 932	
Min. pressure after 10 minutes:	2.2 bar (2.3kp/cm²)	2.5 bar (2.6kp/cm²)	2.0 bar (2.1kp/cm²)
after 20 minutes	2.0 bar (2.1kp/cm²)	2.4 bar (2.5kp/cm²)	1.7 bar (1.8kp/cm²)

* Pressures in the test specification table are given in bar (gauge pressure) and kp/cm² (gauge pressure).

2.6 Fuel distributor

E16

Comparative measurement of fuel deliveries.

Fuel distributor part no. 0 438 100 005 0 438 100 059	Setting point	Max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 160.0 cm^3/min. 1)	6.8 cm^3/min. 44.0 cm^3/min. 175.0 cm^3/min.
Fuel distributor part no. 0 438 100 079	Setting point	Max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 160.0 cm^3/min. 1)	6.7 cm^3/min. 43.0 cm^3/min. 175.0 cm^3/min.
Fuel distributor part no. 0 438 100 100	Setting point	Max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 110.0 cm^3/min. 1)	6.6 cm^3/min. 43.0 cm^3/min. 120.0 cm^3/min.

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm^2 (gauge pressure)

1) This full-load delivery must be obtained at least with maximum deflection of the air-flow sensor plate.

Test step	Test specifications

2.7 Injection valves

F1

Opening pressure:	
Injection valve part no.	
0 437 502 007	2.5...3.6bar (2.6...3.7kp/cm²)
0 437 502 015	
up to FD 828	2.7...3.8bar (2.8...3.9kp/cm²)
0 437 502 016	
as of FD 829	3.0...4.1bar (3.1...4.2kp/cm²)
0 437 502 023/...024	
0 437 502 026/...027	3.0...4.1bar (3.1...4.2kp/cm²)

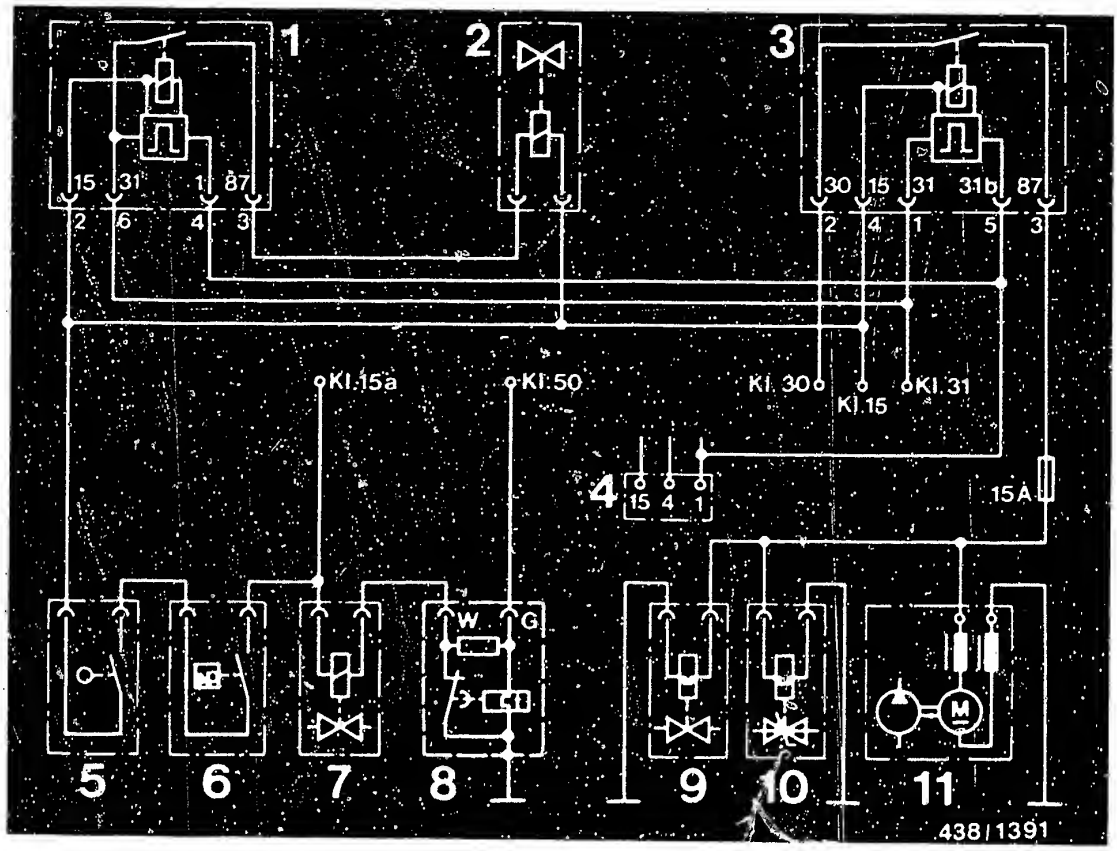
2.8 Idle adjustment[1)]

G1

• Idle speed All versions:	800 ...1000 min^{-1}
• CO concentration	1.0 ...2.0 Vol.%CO

* Pressures in the test-specification table are given in bar (gauge pressure) and kp/cm² (gauge pressure).

1) To adjust/check the idle:
switch on upper beam. Switch off air conditioner. Engine at normal operating temperature, oil temperature approx. +80° C. Radiator fan must not be on when adjusting. The exhaust-gas recirculation system (on Sweden and Switzerland version only) must be rendered inoperative. To set the CO, disconnect crankcase ventilation hose from cylinder head cover and seal.



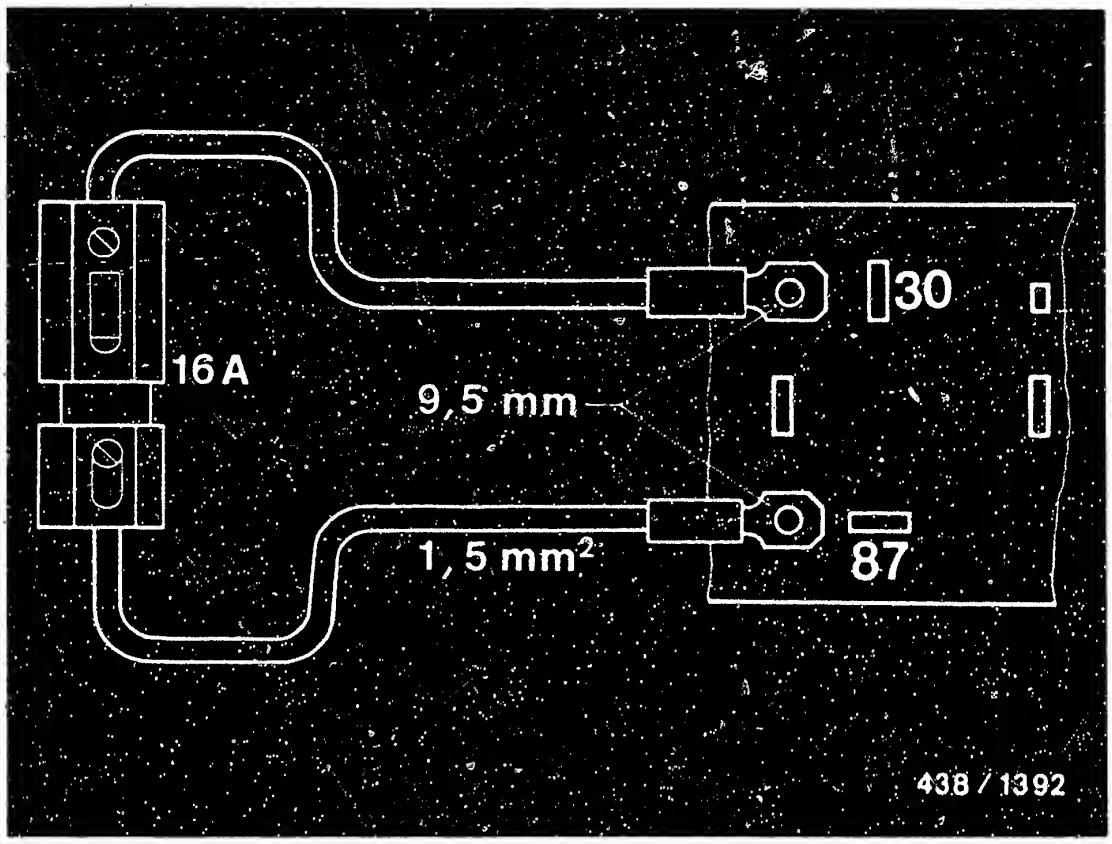
1 = Idle-control unit
2 = Idle valve
3 = Electronic relay
4 = Ignition coil
5 = Throttle-valve switch
6 = Pressure-step switch
(Items 3 - 6= as of 1985 model only)
7 = Start valve
8 = Thermo-time switch
9 = Warm-up regulator
10= Auxiliary-air device
11= Electric fuel pump

3. Electrical safety circuit

3.1 Circuit diagram

As of 1985 model only:
idle-control unit and idle valve for engine-speed increase if engine speed drops below approx. 700 min^{-1}.

Throttle-valve switch and pressure-step switch for acceleration enrichment at temperatures below +35° C.

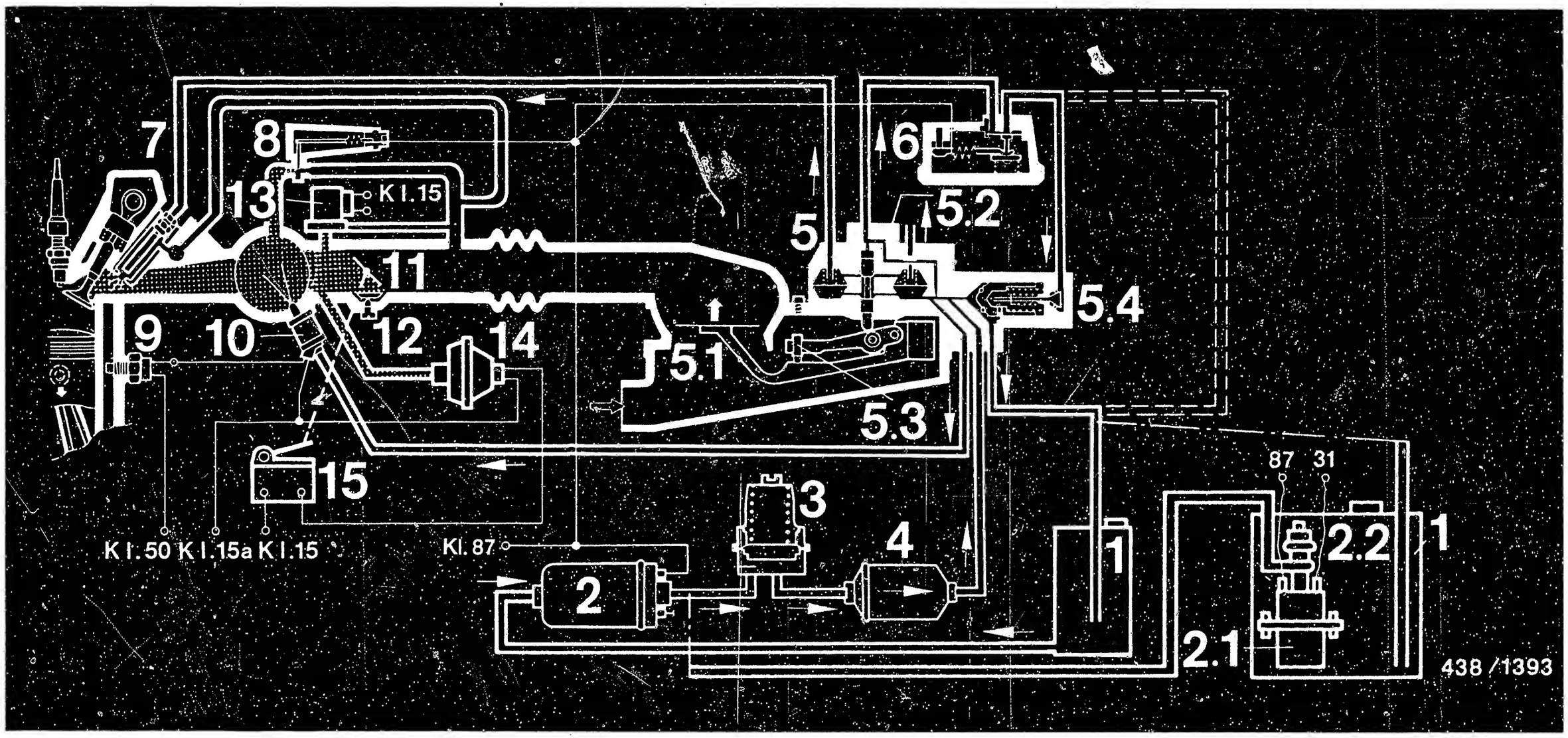


3.2 Jumping the safety circuit

The safety circuit employs an electronic relay which is energized from terminal 1 of the ignition coil.
Remove electronic relay, on left under instrument panel, from relay board (location 2) and connect contacts 30 and 87 with a jumper.
This supplies battery voltage to electric fuel pump, warm-up regulator and auxiliary-air device.

C A U T I O N !

Never lift the sensor flap with the engine running because fuel will be injected. Subsequent starting can lead to severe engine damage!



4. Diagram of fuel lines

1 = Fuel tank
2 = Electric fuel pump or
2.1 = In-tank electric fuel pump
2.2 = Pressure damper
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
5.3 = Idle-mixture-adjusting screw
5.4 = Primary-pressure regulator
6 = Warm-up regulator
7 = Injection valve
8 = Auxiliary-air device
9 = Thermo-time switch
10 = Start valve
11 = Throttle valve
12 = Idle-speed-bypass screw

As of 1985 model:

13 = Idle valve
14 = Pressure-step switch
15 = Throttle-valve switch

=== Warm-up regulator return on vehicles up to 7.77 directly to return line to fuel tank (fuel distributor without push valve).

5. GENERAL INFORMATION

5.1 Introduction

The following vehicle models with 1.6...1.8l/4-cylinder engines are supplied with K-Jetronic:

Golf GTI	(6.76→)	Europe version
Scirocco GLI, GTI	(6.76→)	
Golf-Cabrio	(7.79→)	
Jetta LI, GLI	(7.79→)	
Jetta GT	(1.84→)	
Golf, Scirocco, Jetta	(7.79→)	Sweden and Switzerland version

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 1 - B 4 is intended to make it easier to decide which test steps have to be carried out for certain faults.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

5.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

5.3 The following components are different or extra:

- 4-cylinder mixture-control unit with updraft air-flow sensor.

As of start of production

- There is overpressure in the fuel tank. Therefore, before loosening the fuel lines, reduce the overpressure by opening the tank filler cap.
- The inlet-union screw on the fuel filter has an integrated non-return valve. The hexagonal section is provided with two grooves for identification.
- Safety circuit with electronic engine-speed relay.

As of 1978 model

- Fuel distributor with push valve integrated in primary-pressure regulator.

As of 1981 model

- Fuel distributor with adjustable differential-pressure valves. On this version, there are screw plugs next to the fittings for the injection lines.
  This adjustment possibility has been introduced only for production at the factory. This does not result in any additional adjustment possibilities for the after-sales service. The fuel distributor should be treated in precisely the same manner as the standard version. The screw plugs must not be loosened.

As of 1984 model

- Air-shrouded injection valves for improved mixture formation, particularly at idle. Air distribution in cylinder head.
- Pre-supply pump in tank to avoid hot delivery problems. Tank pressureless.
- Additional small fuel tank with strainer.
- Minifilter in inlet-union screw of fuel distributor inlet.

As of 1985 model

- Injection valves with fixed air-guide cap for air shrouding. Air distribution in cylinder head. To connect these injection valves to the tester for delivered-quanitity comparison, adapters KDJE-P 200/19 are required.
- In-tank electric fuel pump with replaceable non-return valve and screwed-on pressure damper to reduce noise.
- Cold acceleration enrichment at temperatures below +35° C through start valve. Switched via throttle-valve switch, pressure-step switch and thermo-switch.
- Idle valve 1 for engine-speed increase through air bypass. Switched by idle control unit below 700 min^{-1}.
- Idle valve 2 for engine-speed increase with air conditioner on.

5.4 Other equipment

Vehicles of the Sweden and Switzerland version are equipped with exhaust-gas recirculation. Some of the exhaust gas is recirculated to the air-intake system where it takes part once again in combustion.
When performing trouble-shooting and adjustments on the vehicle, particularly when performing the idle adjustment, the influence of these additional (possibly defective) components must be taken into consideration.

6. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034)

  For testing all fuel pressures and testing for leaks.

- Adjusting wrench KDEP 1035

  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)

  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451)

  For comparing the fuel delivered from the individual fuel-distributor outlets.
  Adapter KDJE-P 200/19 for injection valves with fixed air-guide caps.

- Electric connecting cable (test lead)

  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Graduate (commercially available, approx. 1.5 l capacity)

  For measuring the delivery of the electric fuel pump.

- Electrics tester or multimeter e.g.

ETE 014.00	0 684 101 400
Philips	PM 2517 X
Miselco	Master 50K
Chinaglia	Cortina

- Tool set for fitting and removing the idle anti-tamper device on the air-flow sensor.
  (e.g. No. 4521/7 from Hazet Co. 5630 Remscheid).

- Valve tester KDJE-P 400 (previously KDJE 7452).

  For testing the injection valves.

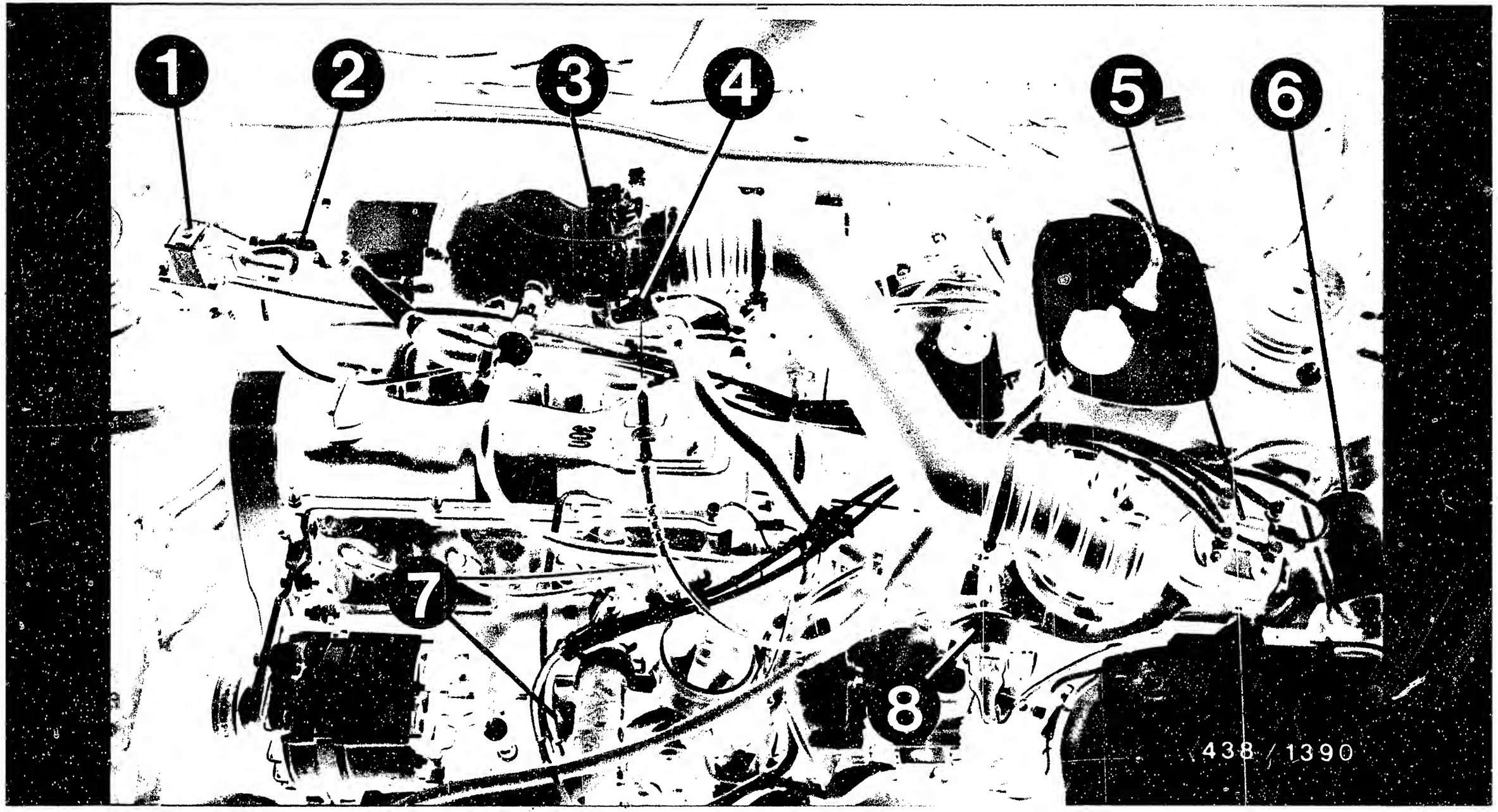
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part Designation VS 14942-CH
Previously Part No. 5 973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co.
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)

  For adjusting the idle speed

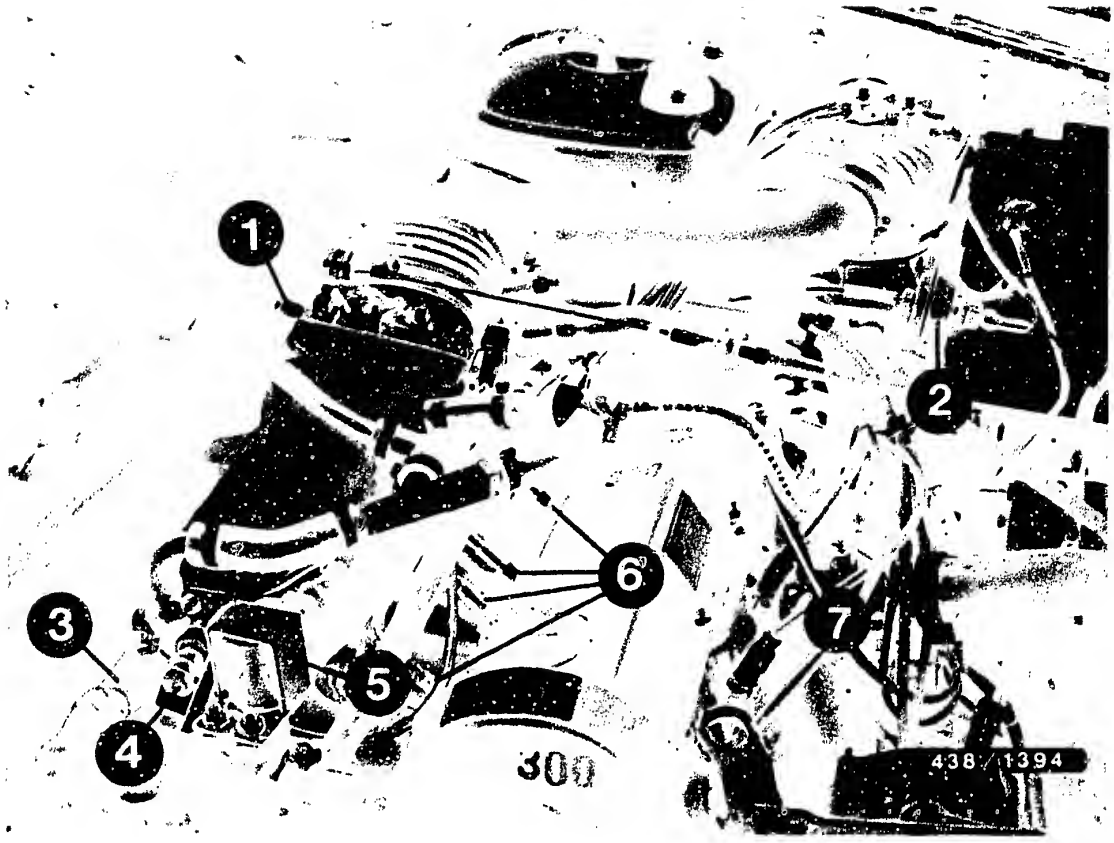
Exhaust-gas analyzer calibrated For idle CO adjustment	eg. ETT 008.00	0 684 100 800
	ETT 008.04	0 684 100 804
	ETT 008.05	0 684 100 805



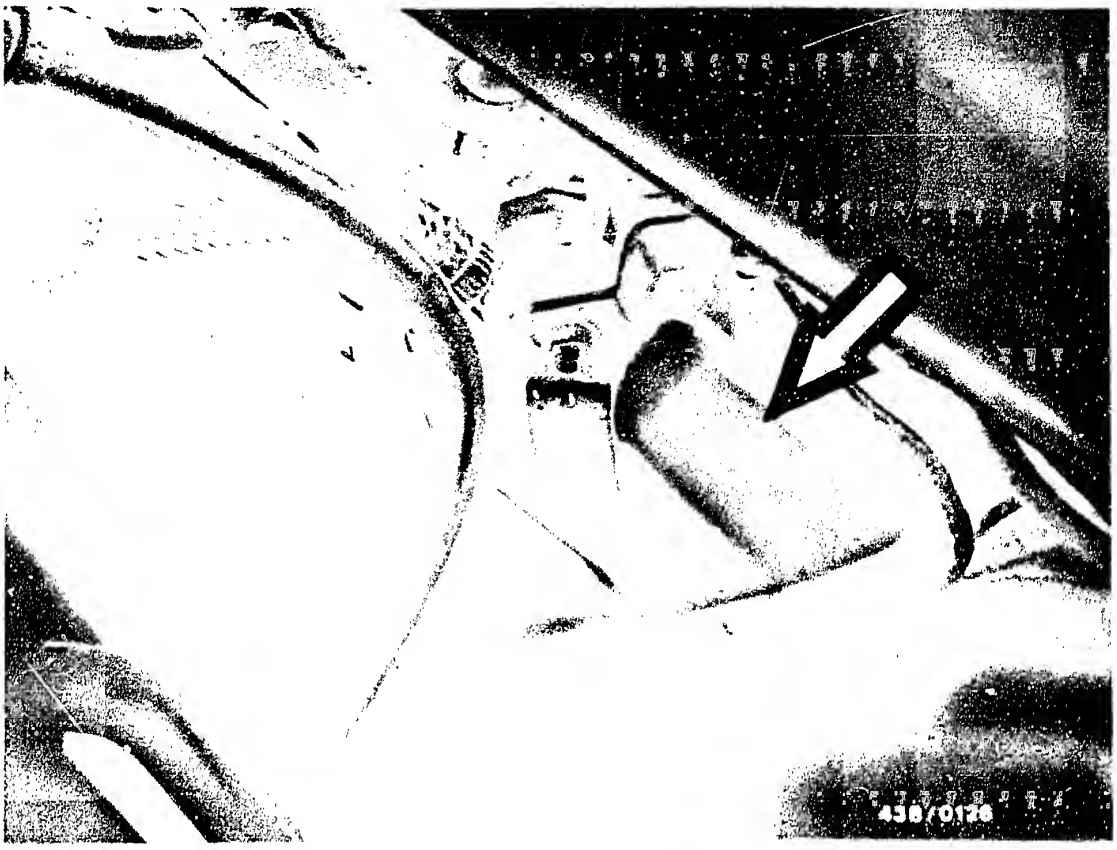
7. INSTALLATION POSITION OF COMPONENTS

7.1 Arrangement of components on engine

1 = Idle valve
2 = Start valve
3 = Throttle-valve assembly
4 = Throttle-valve switch plug
5 = Mixture-control unit
6 = Fuel filter
7 = Warm-up regulator
8 = Pressure-step switch



1 = Idle-speed bypass screw
2 = Pressure-step switch
3 = Thermo-time switch
4 = Injection valves
5 = Idle valve
6 = Start valve
7 = Auxiliary-air device



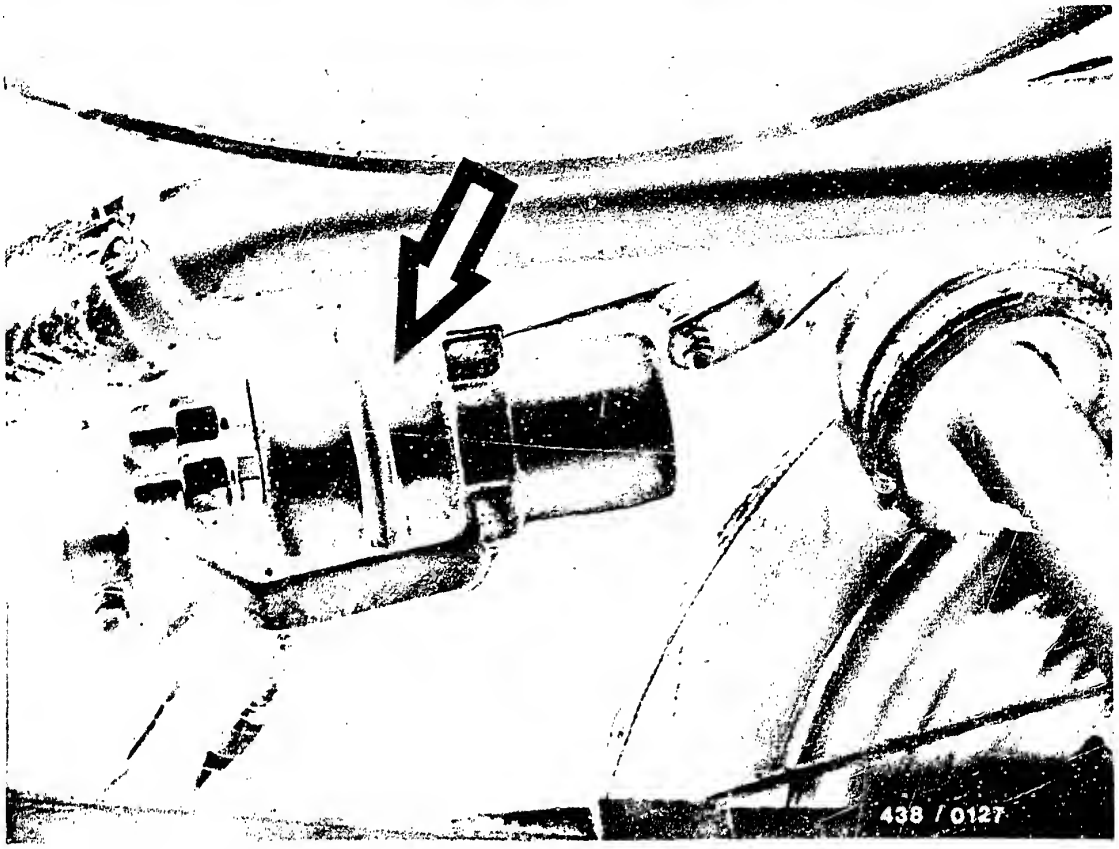
7.2 Fuel-supply components

- As of start of production

  The electric fuel pump is mounted on the vehicle floor by a bracket in front of the rear axle (on the right-hand side as viewed in the forward direction of travel).
  It is made accessible by removing the dirt-protection plate (arrow).

- As of 1985 model

  The in-tank electric fuel pump with replaceable non-return valve and screwed-on pressure damper is accessible through the closure ring on the top side of the fuel tank.



The fuel accumulator (arrow) is located on a support piece above the rear axle on the right-hand side as viewed from behind the vehicle.

Due to the large amount of dirt accumulating at the place where these components are installed, the connections should be cleaned thoroughly before loosening.

8. Trouble-shooting chart

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart is intended to make it easier to find the test steps required for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Trouble-shooting chart (see also Coordinates B4/B5)

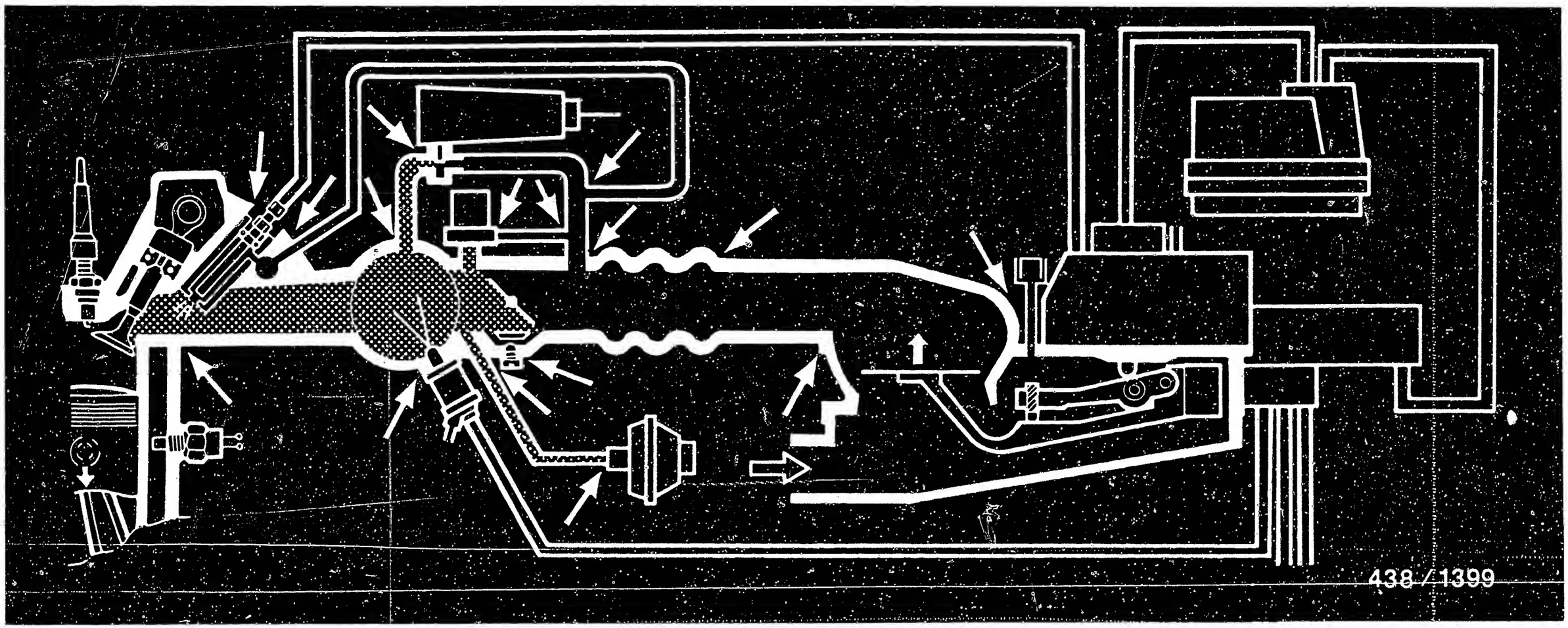
Customer complaint (fault symptom)

* Note:
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-starting performance is stil unsatisfactory, this can be improved by fitting a pulse relay.
The fitting of this relay is described on Coordinate N5.

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition (hot-starting difficulties)*	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinate
	●	●	●	●		●	Air-intake system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Auxiliary-air device not opening	B 22
●	●				●		Electrical fuel pump not operating	C 1
●				●			Cold-starting system defective. Cold acceleration enrichment defective.	C 5
		●	●				Cold-start valve leaking	C 7
				●			Excessive fuel delivery for control-pressure circuit	C 13
●		●					"Cold" control pressure outside tolerance	C 11
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 11
			●	●		●	"Warm" control pressure too low (after warm-up)	C 11
					●	●	Primary (system) pressure outside tolerance	D 4
	●						Overall fuel system leaking	E 1
●	●	●	●		●		Injection valves leaking, opening pressure too low	F 1
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 10
●	●	●	●	●			Basic CO adjustment incorrect	G 1
						●	Basic idle setting incorrect	---

Customer complaint (fault symptom) (continued)

8. Engine runs on ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration at idle too high	12. CO concentration at idle too low	13. Idle speed not adjustable (too high)	14. Engine starts but then dies again immediately	Cause	Coordinates
		●		●			Vacuum system leaking	B 6
●		●	●	●			Air-flow sensor lever/control plunger stiff	B 8
●							Position of air-flow sensor plate incorrect	B 18
					●		Auxiliary-air device not closing	B 23
						●	Electric fuel pump not operating	C 1
●	●		●				Start valve leaking	C 7
		●				●	Fuel delivery for control-pressure circuit too great	C 13
		●				●	"Warm" control pressure (after cut-back) too high	C 11
	●	●	●			●	"Warm" control pressure (after cut-back) too low	C 11
		●				●	Primary pressure not within tolerance	D 4
●							Injection valves leaking; opening pressure too high	F 1
		●					Imbalance (dispersion of fuel deliveries)	F 10
●	●	●	●	●	●		Basic idle setting incorrect	G 1



Test sections

9. Checking air intake system for leaks

The arrows in the illustration above indicate typical points where leaks may occur. Check these points visually, and proceed as follows if in doubt:
Disonnect hose from outlet of auxiliary-air device and, using a compressed-air gun, blow air through this hose into the intake system. Open throttle valve fully when doing this. Brush joints with soapy water or spray with leak-detector spray (e.g. Güpoflex).

Never use combustible fluids to perform leak tests.
Leaks are indicated by the formation of bubbles or foam.
When performing leak tests, pay particular attention to injection valve O-rings and insulating sleeves.
If necessary, tighten using a hexagonal offset wrench (12 mm). After repairing any leaks, reset the idle speed with the engine at operating temperature.
The idle adjustment procedure is explained at coordinates G 1.

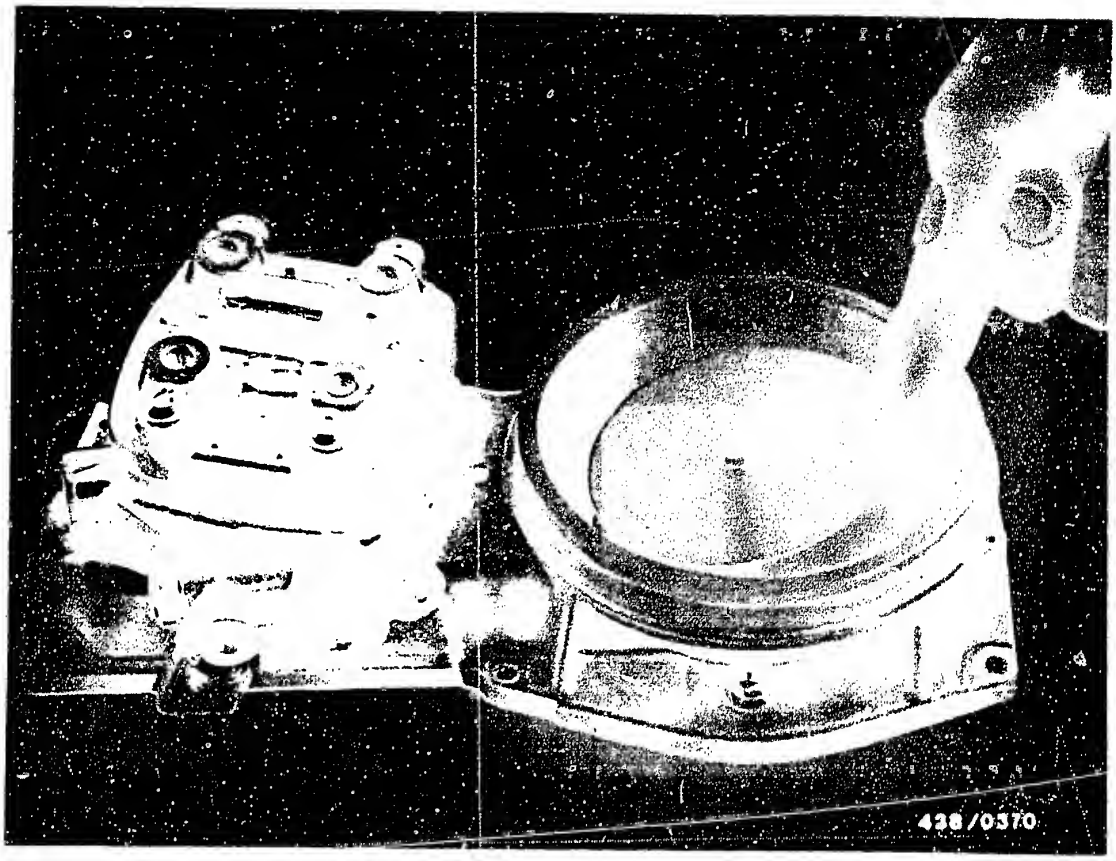
10. Checking the main lever in the air flow sensor and the control plunger in the fuel distributor for freedom of movement

10.1 Preparations

- Engine temperature must be at least +20°C.
- Remove rubber cover (loosen 2 clamping bands) to provide access to the sensor plate of the air flow sensor.
- Run the electric fuel pump for a period of approx. 10 seconds by bridging the safety circuit. This applies control pressure to the control plunger in the fuel distributor.

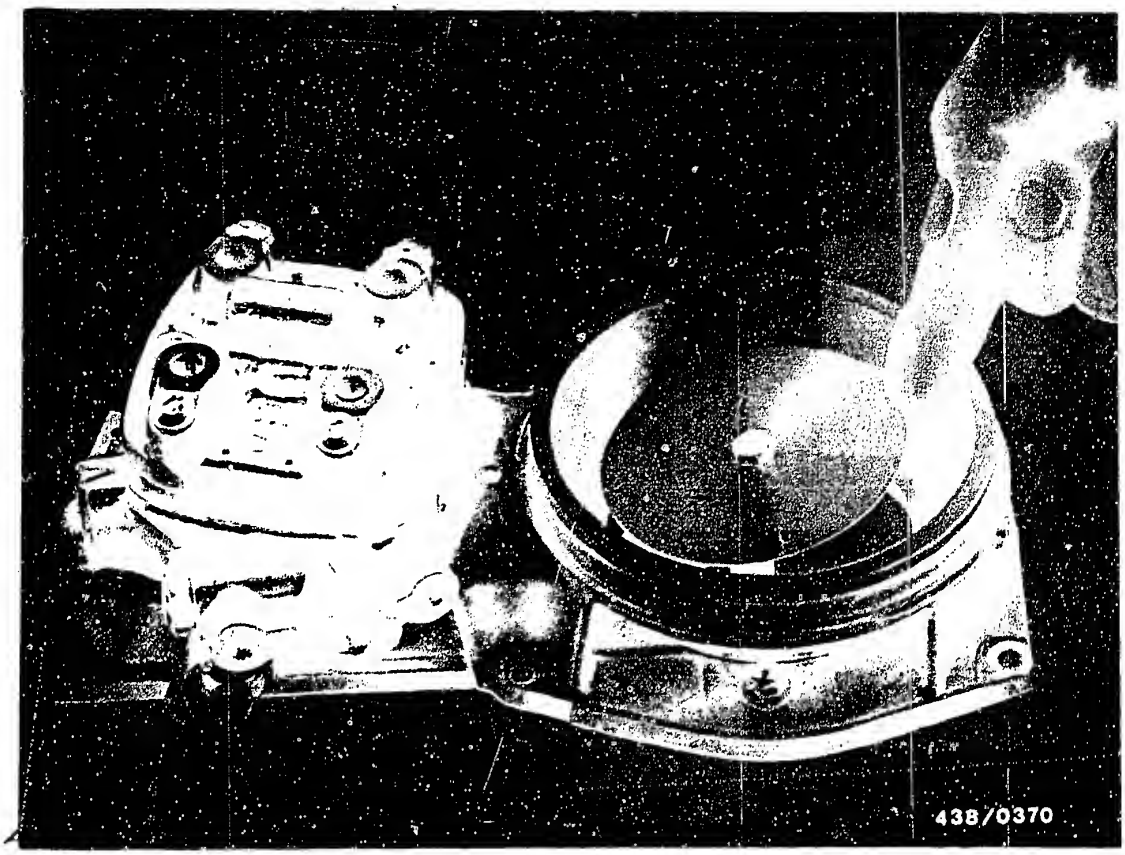
C A U T I O N !

Never lift the sensor flap with the engine running because fuel will be injected. Subsequent starting can lead to severe engine damage!



10.2 Check that the control lever moves freely

Raise the air-flow sensor plate by hand (updraft) and release again.
The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop.
If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (VW parts).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



10.3 Check that the control plunger moves freely.

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

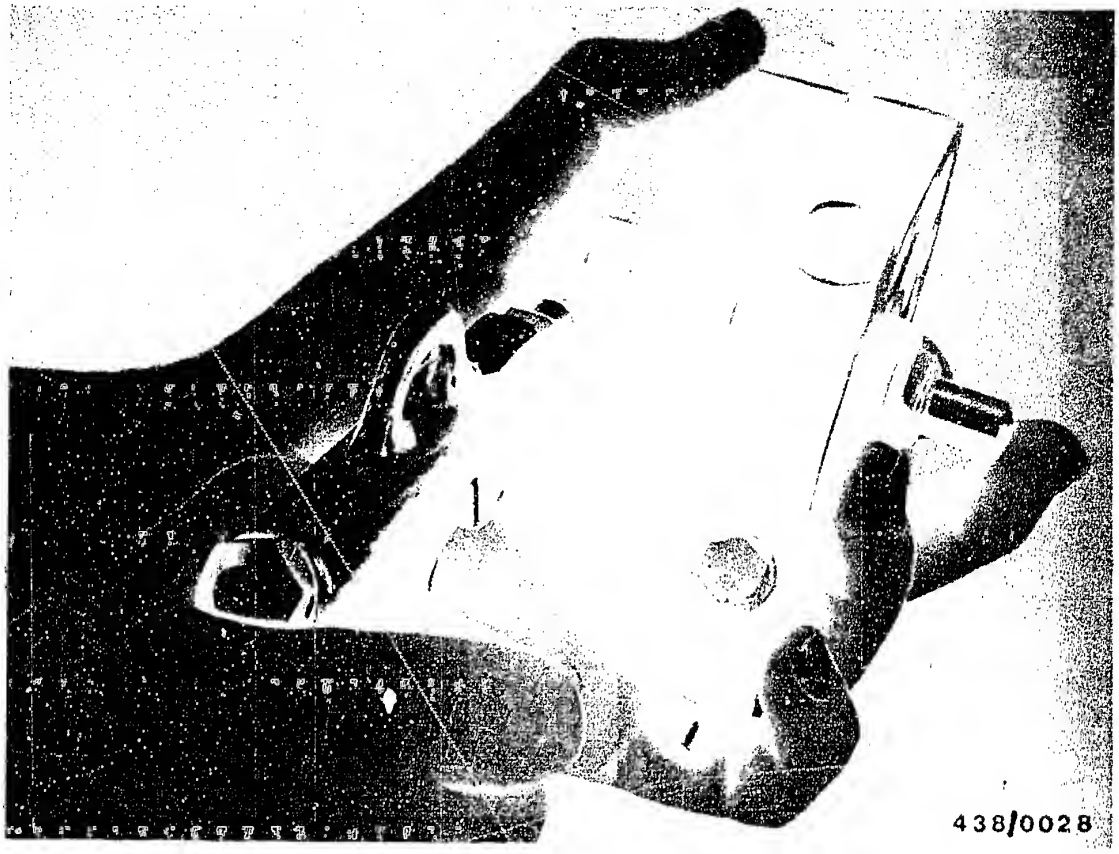
If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!
Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

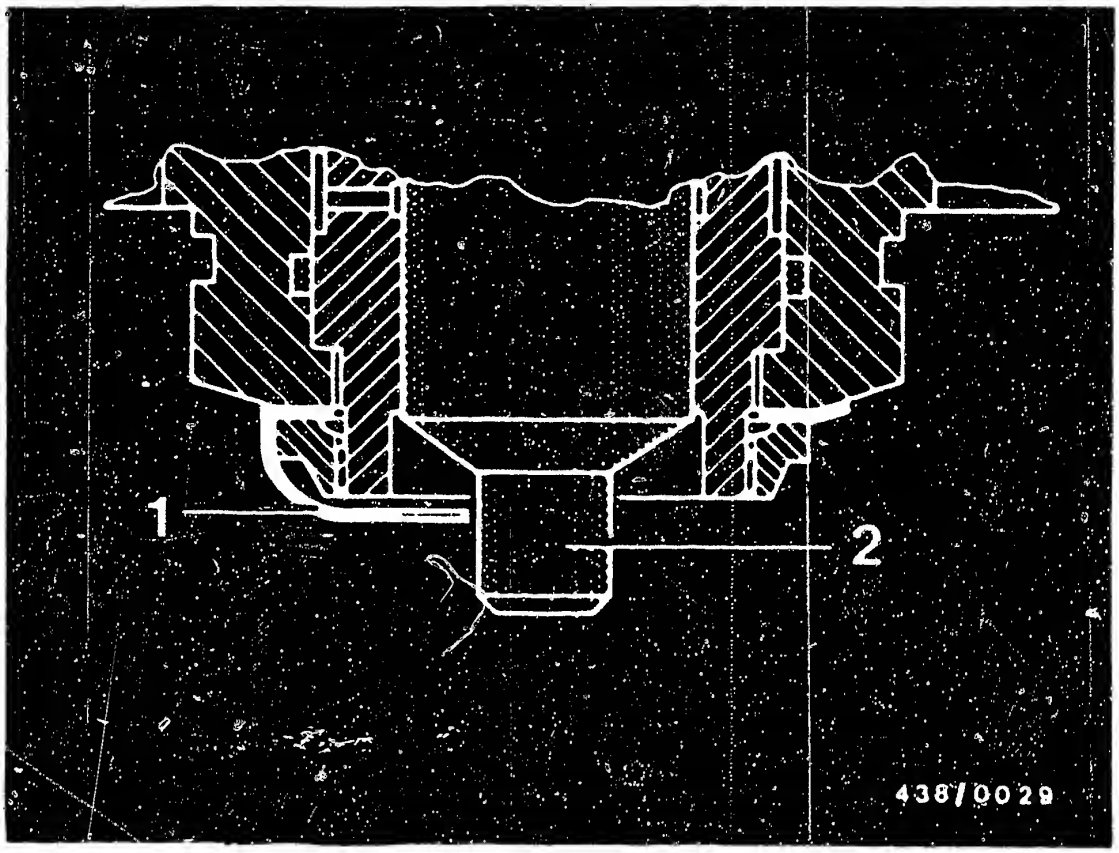
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.

Remove the plunger. Under certain conditions in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with Benzine. If the plunger still does not move freely, replace the fuel distributor.

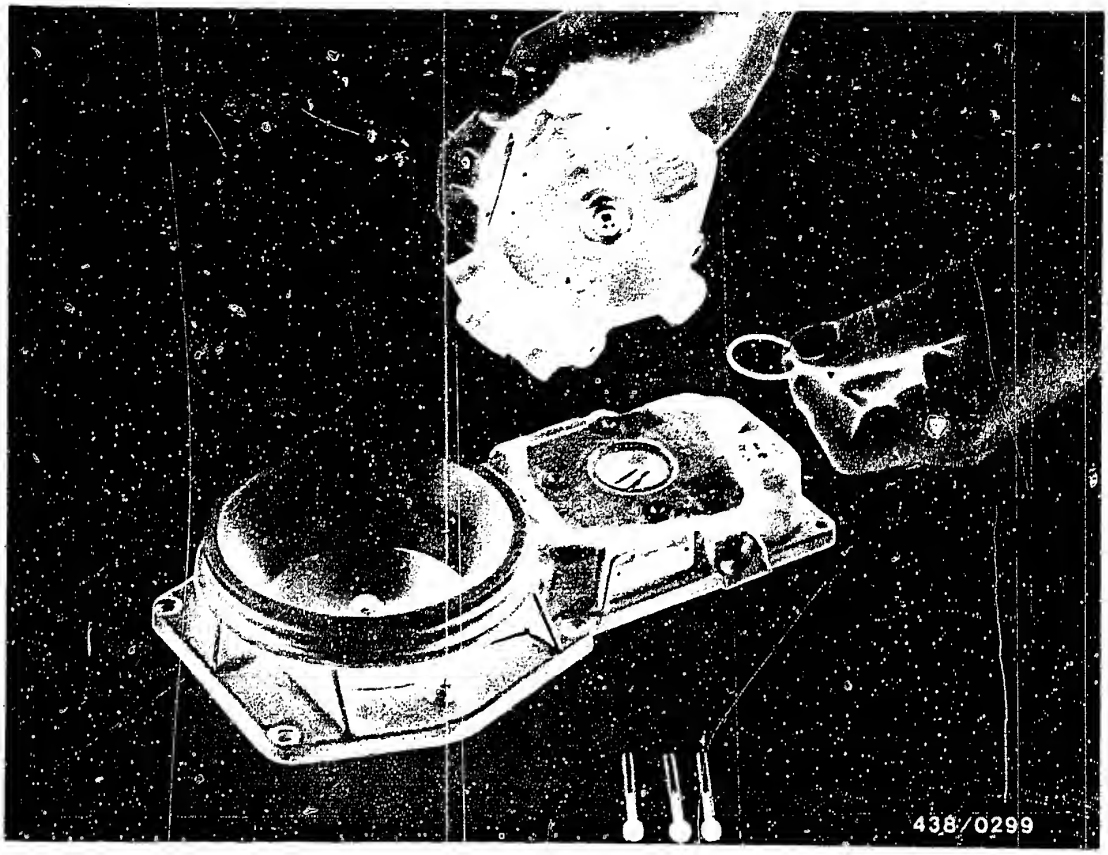
Caution!
Some fuel distributors are additionally equipped with a compression spring above the control plunger and with a drop-out safeguard.
When removing the control plunger, firstly bend up the drop-out safeguard, pay attention to the compression spring and re-insert them when assembling.



1 = Drop-out safeguard
2 = Control plunger

10.4 Fuel distributor with drop-out safeguard for the control plunger

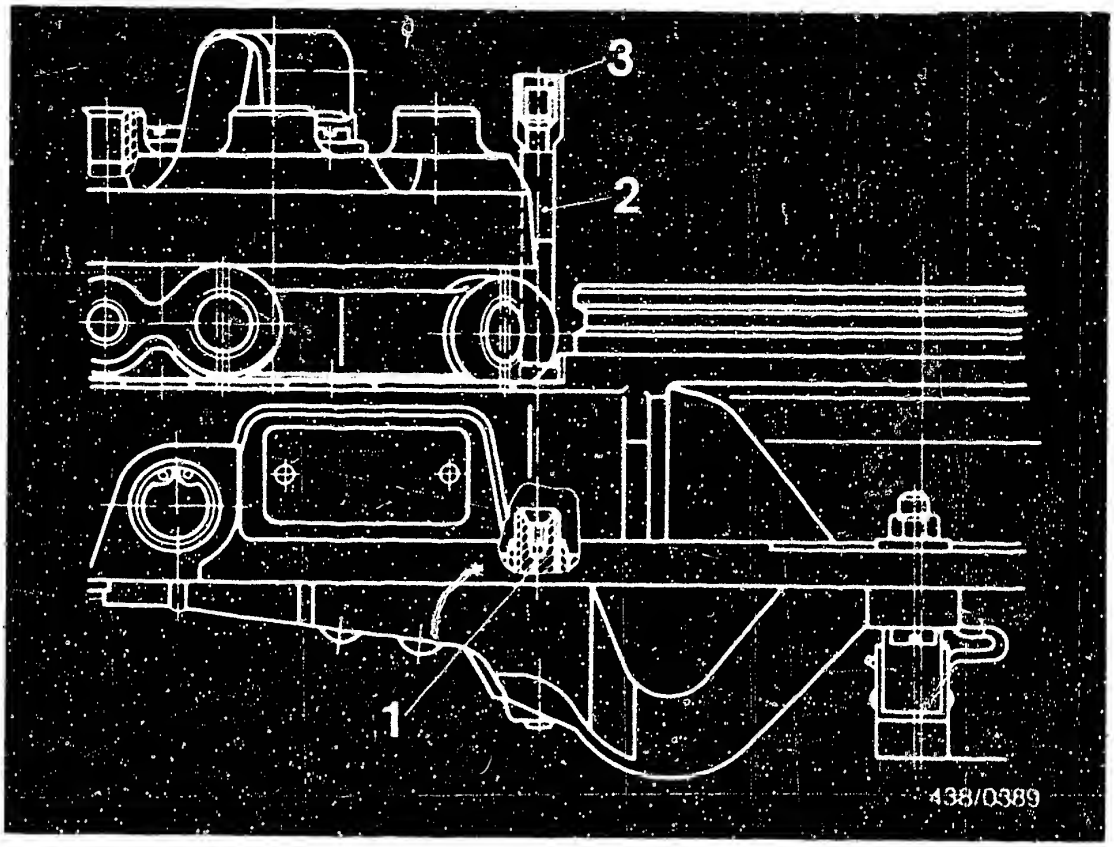
Caution!
The fuel distributors have a drop-out safeguard for the control plunger.
This metal safeguard also serves as an in-transit protection device and facilitates assembly.
The drop-out safeguard must not be removed.



10.5Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

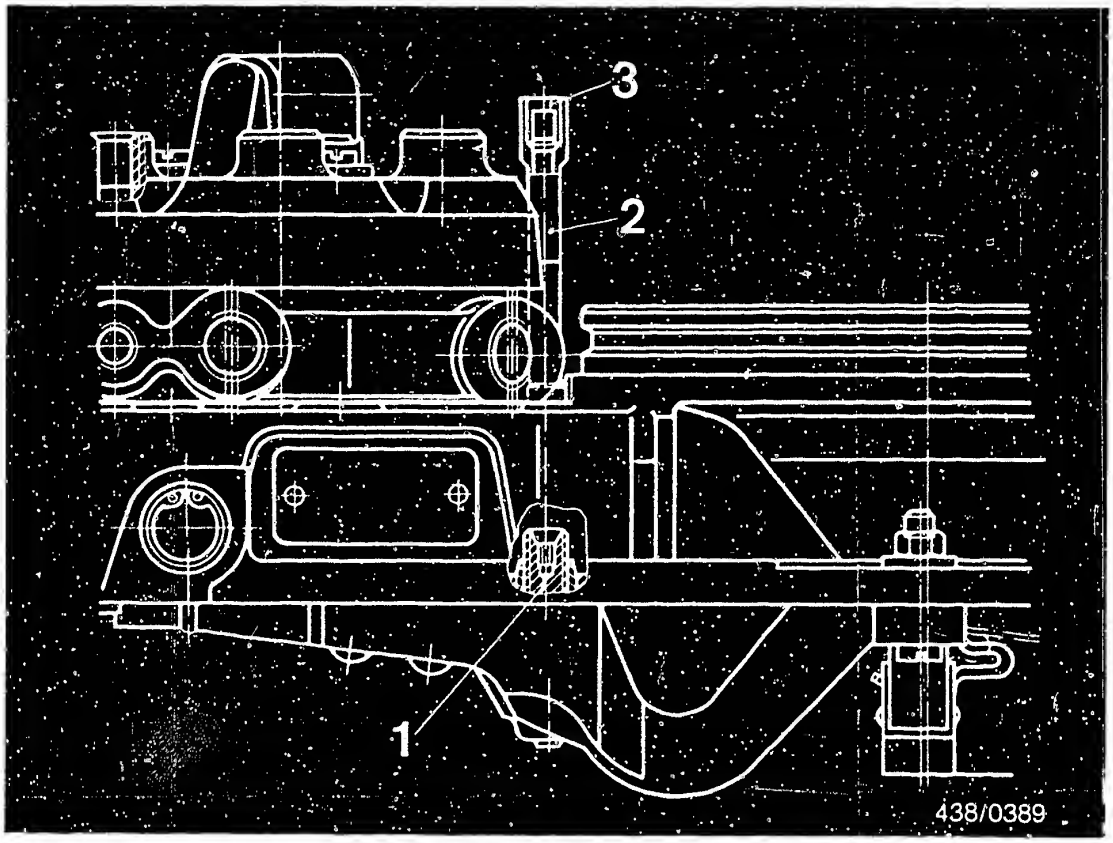
When connecting the fuel-injection tubing, use new seal rings.



1 = Mixture-control screw
2 = Guide tube
3 = Lead seal

10.6 Matching the fuel distributor to the air-flow sensor for initial starting

Screw off one fuel-injection line from the fuel distributor. Bridge the electrical safety circuit so that the electric fuel pump operates.



1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.

Remove anti-tamper device (lead seal) of the idle-mixture-adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole into the idle-mixture-adjusting screw.

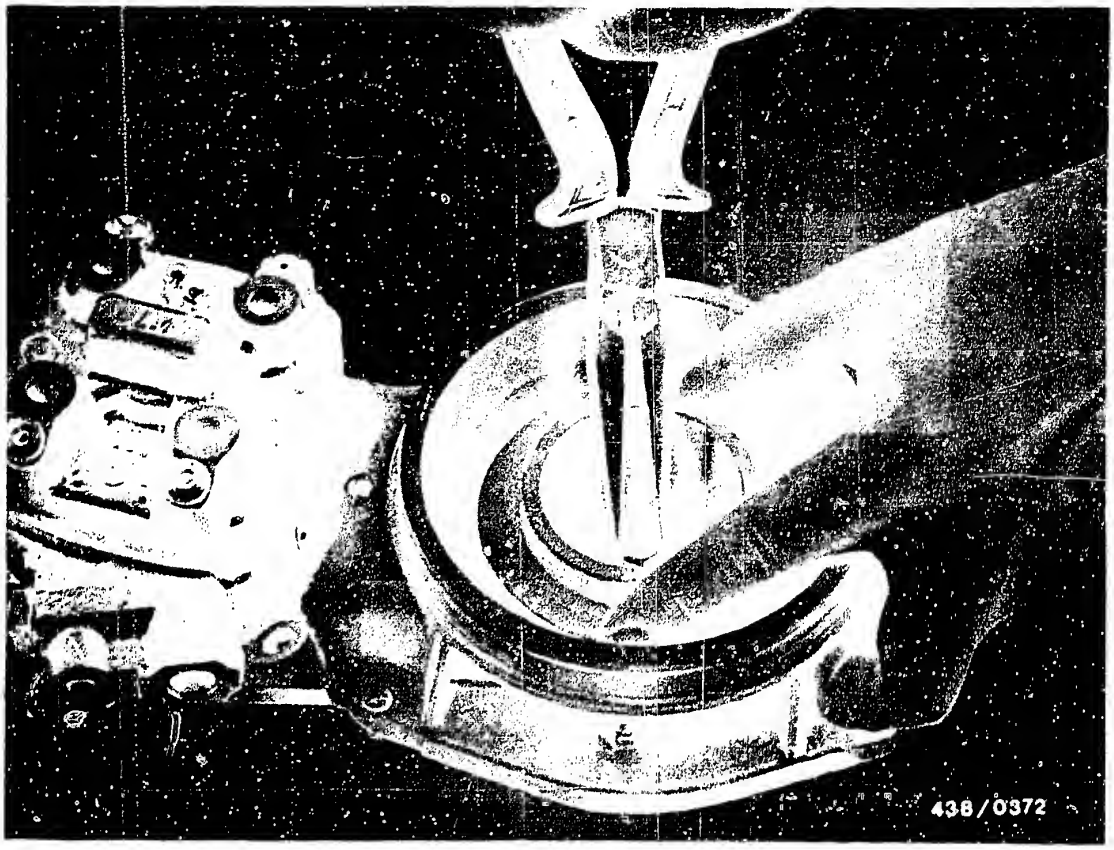
CAUTION!
Never deflect (lift) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the idle-mixture screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 1.



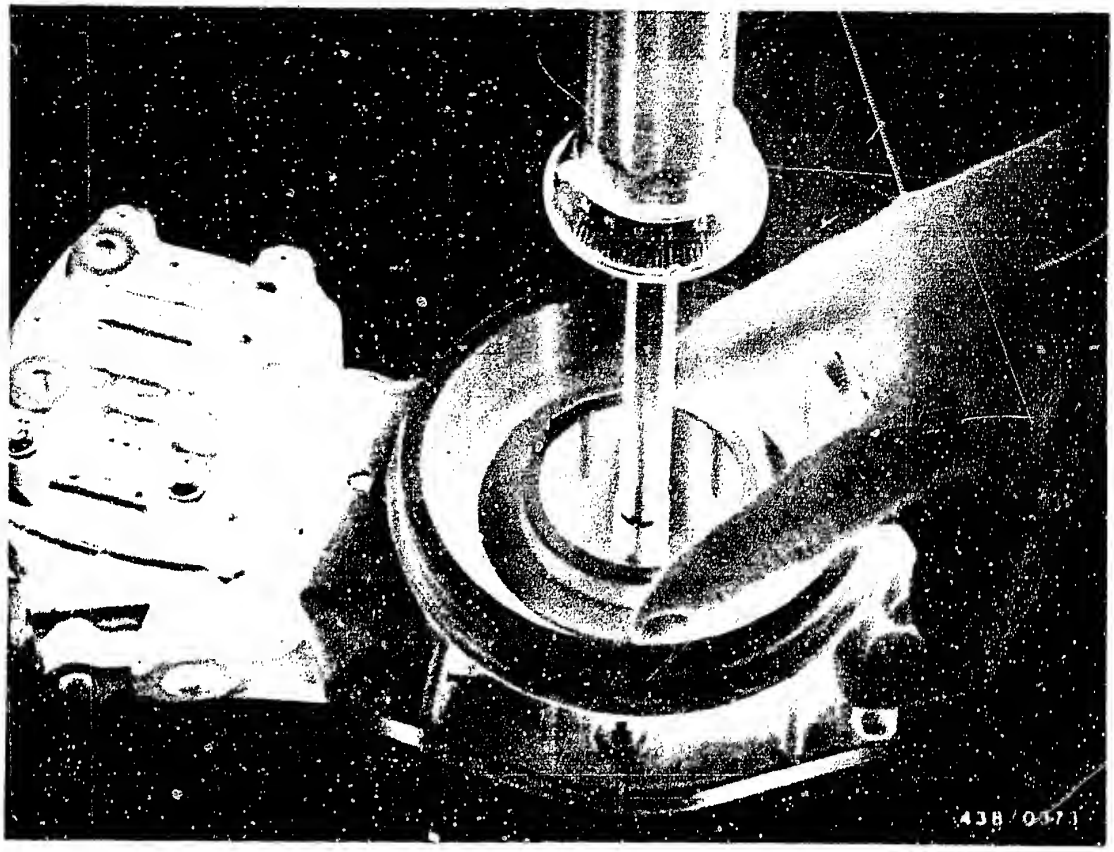
11. Checking and adjusting the position of the air-flow sensor plate

11.1 Preparations

- Engine temperature is not important.
- Remove the rubber hood from the air-flow sensor (release 2 clamping bands), so that the air-flow sensor plate becomes accessible.

11.2 Centering the air-flow sensor plate

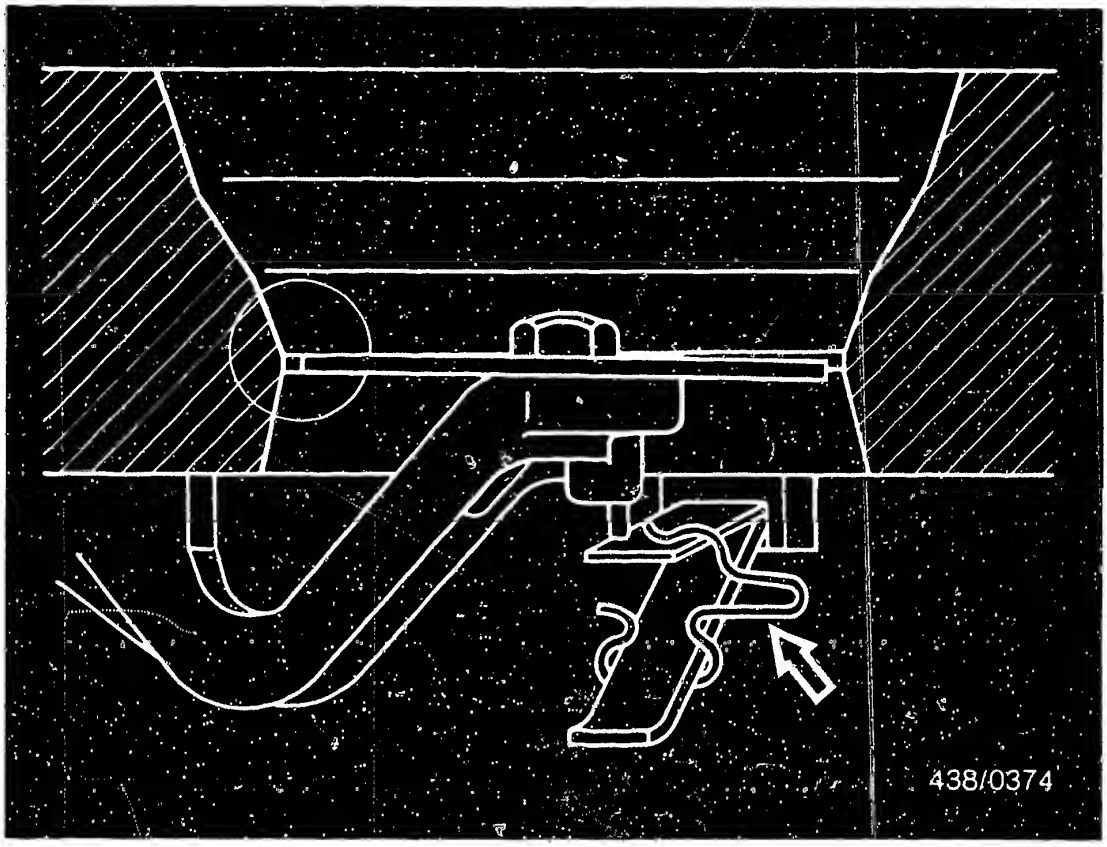
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:



Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.

With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

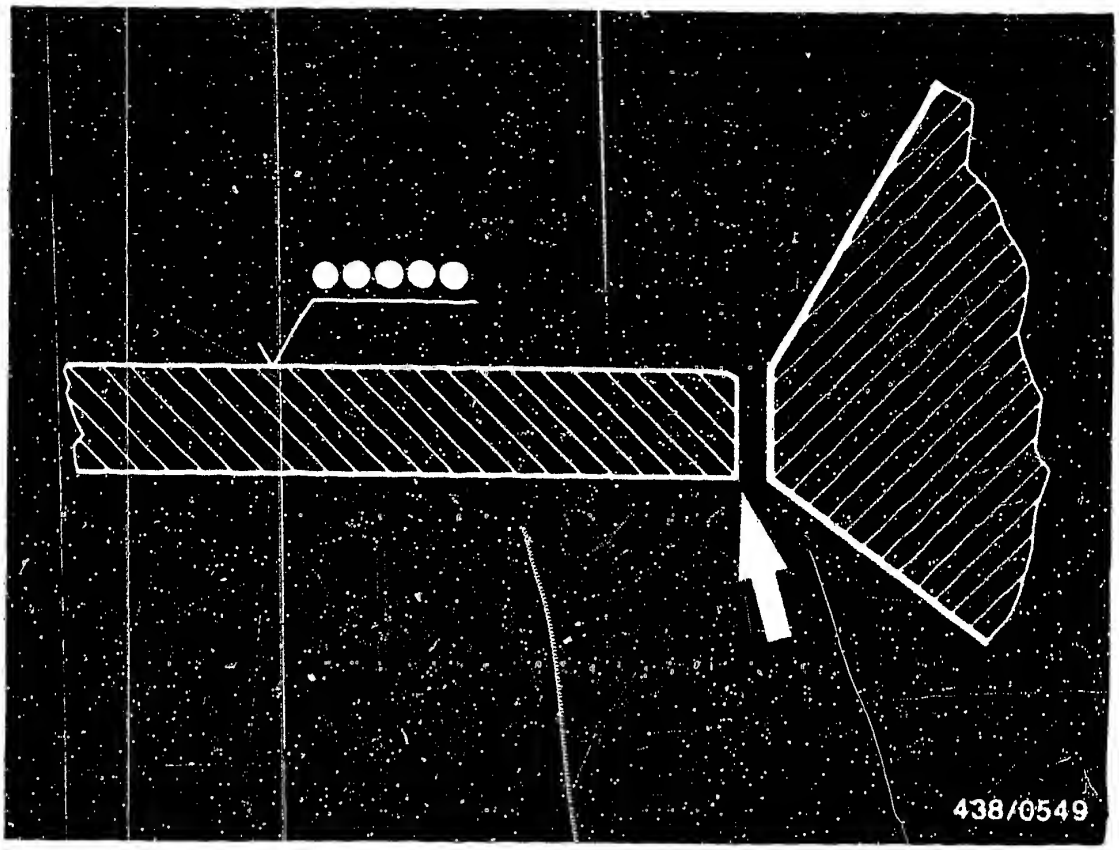
It must no longer be possible to turn the air-flow sensor plate by hand.



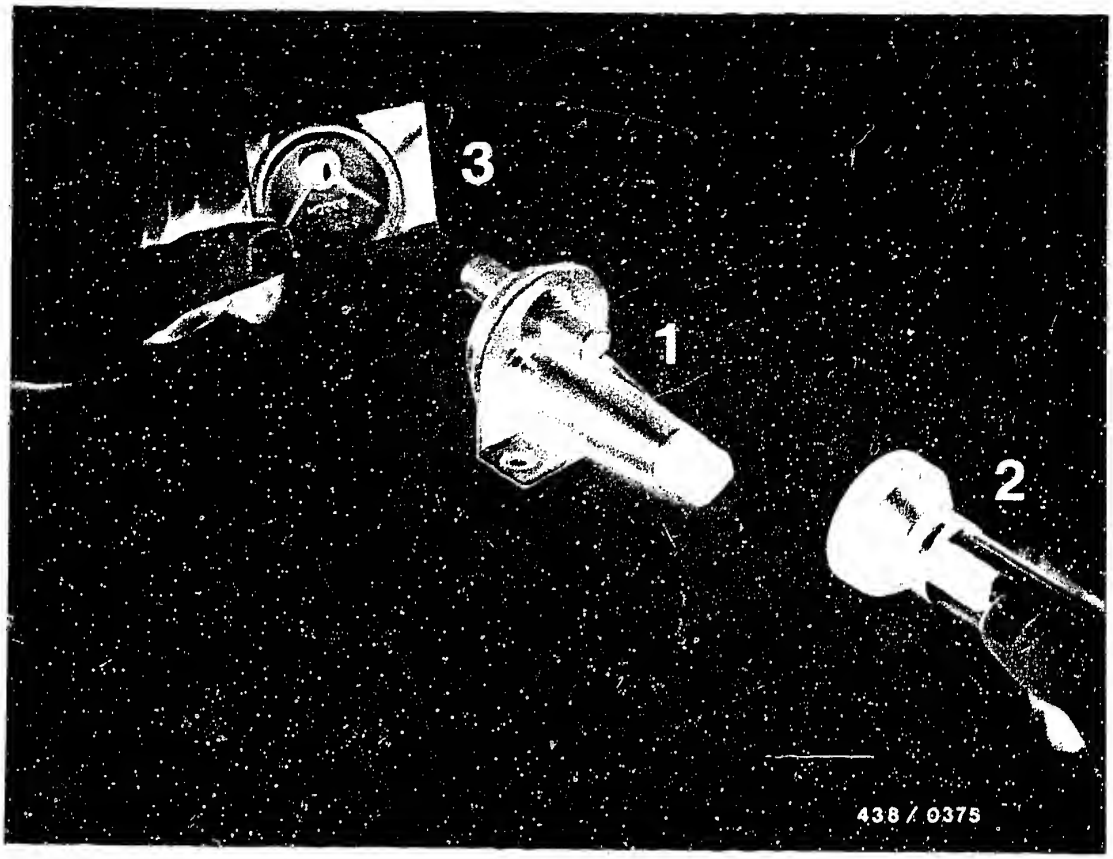
11.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone in the position shown in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.
If necessary, the position of the air-flow sensor plate can be adjusted by bending the shaped spring (arrow).



Caution:
Be sure that sensor plate is mounted in correct position! Its upper side is identified by five punch marks (in a row).
The sharp edge (arrow) is at the bottom.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

12. Checking the operation of the auxiliary-air device

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device. Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open. It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

If an opening is not visible with the engine cold, replace the auxiliary-air device.

Fit the electric cable plug on the auxiliary-air device.

By bridging the electrical safety circuit, supply power to the auxiliary-air device.
After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

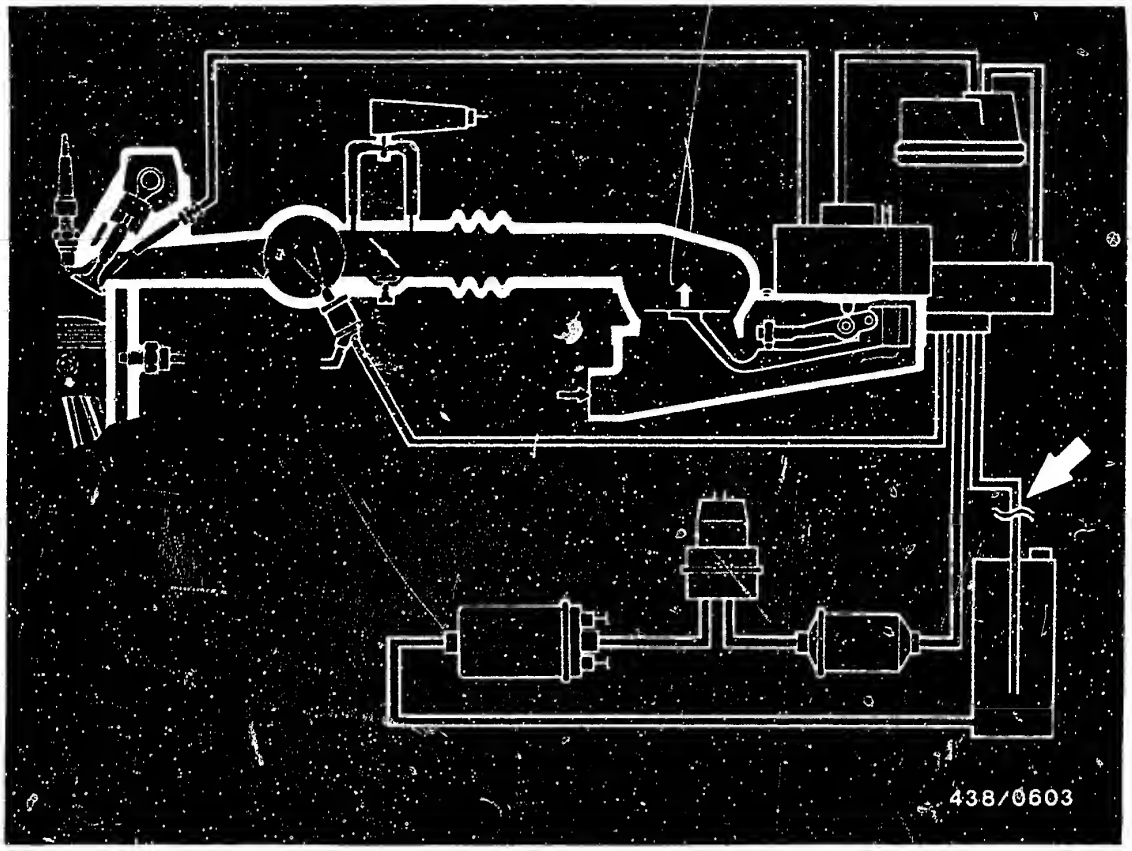
If the blocking plate does not close, check the power supply (open circuit, voltage drop).
Minimum voltage across the connector 11.5 V with the engine stopped.

If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

Replace the auxiliary-air device if defective.

When the auxiliary-air device has been replaced, readjust the idle speed.

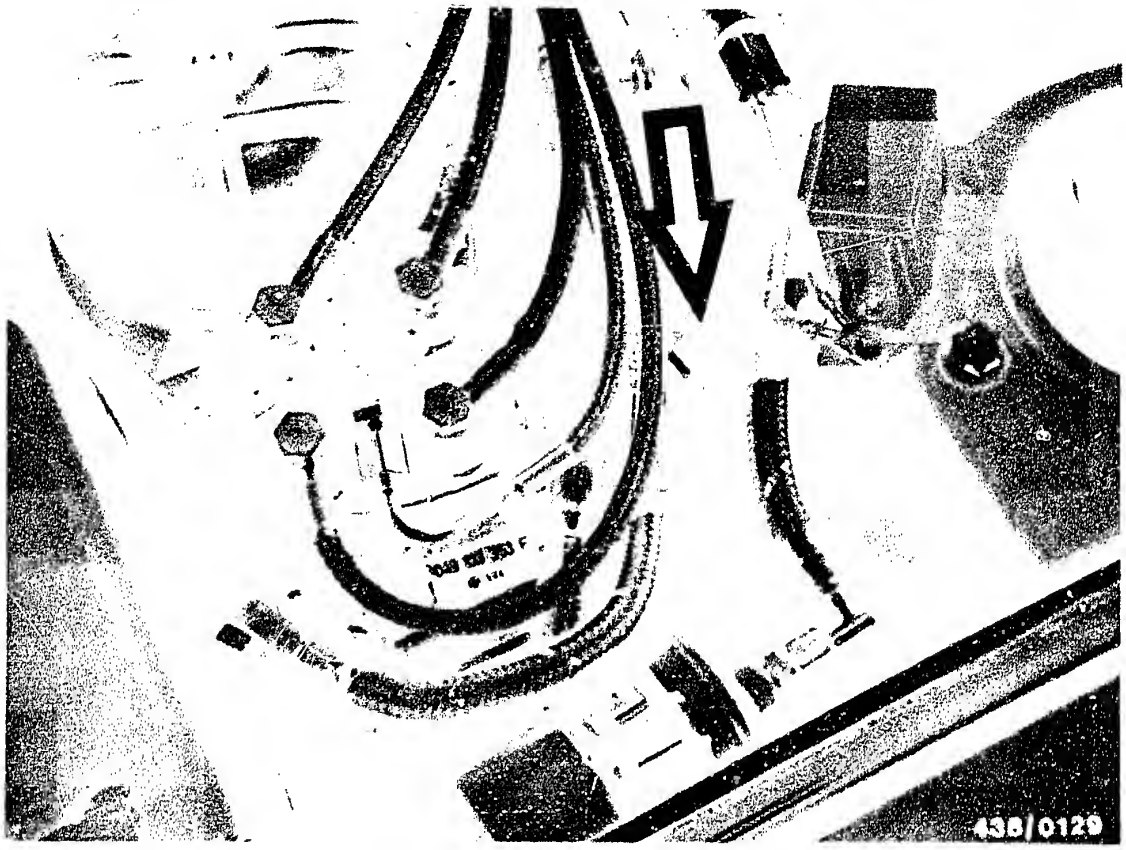
Idle adjustment is described on Coordinates G 1.



13. Checking the operation of the electric fuel pump.

13.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



13.2 Measuring point:

A suitable measuring point for fuel-delivery testing is the screw connector (arrow) in the fuel return line to the fuel tank.

Before loosening the lower connector, vent the fuel tank by opening the tank filler cap.
Fit the test hose with an annular connection piece and connect to the return hose of the fuel distributor with inlet-union screw M 14x1.5 as well as copper seal rings.

Hold the end of the hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

13.3 Testing:

Disconnect plugs from warm-up regulator and auxiliary-air device.

Switch on electric fuel pump for precisely 30 seconds by jumping the safety circuit and measure the fuel delivery in a measuring glass.

Caution:

Never deflect (raise) the air-flow sensor plate while the electric fuel pump is running since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

13.4 Test specification:

Fuel delivery: min. 750 cm^3 /30 seconds

13.5 Possible cause of fuel delivery being too low

- Power supply to electric fuel pump not O.K., voltage drop. Necessary minimum voltage across terminals = 11.5 V with electric fuel pump on.

- Fuel filter very dirty.

As of 1984 model

- Minifilter in inlet-union screw of fuel distributor inlet dirty.
- Pre-supply pump in tank defective.
- Tank with strainer clogged.

If the above-mentioned items are O.K., the cause lies with the electric fuel pump itself.
Replace electric fuel pump.

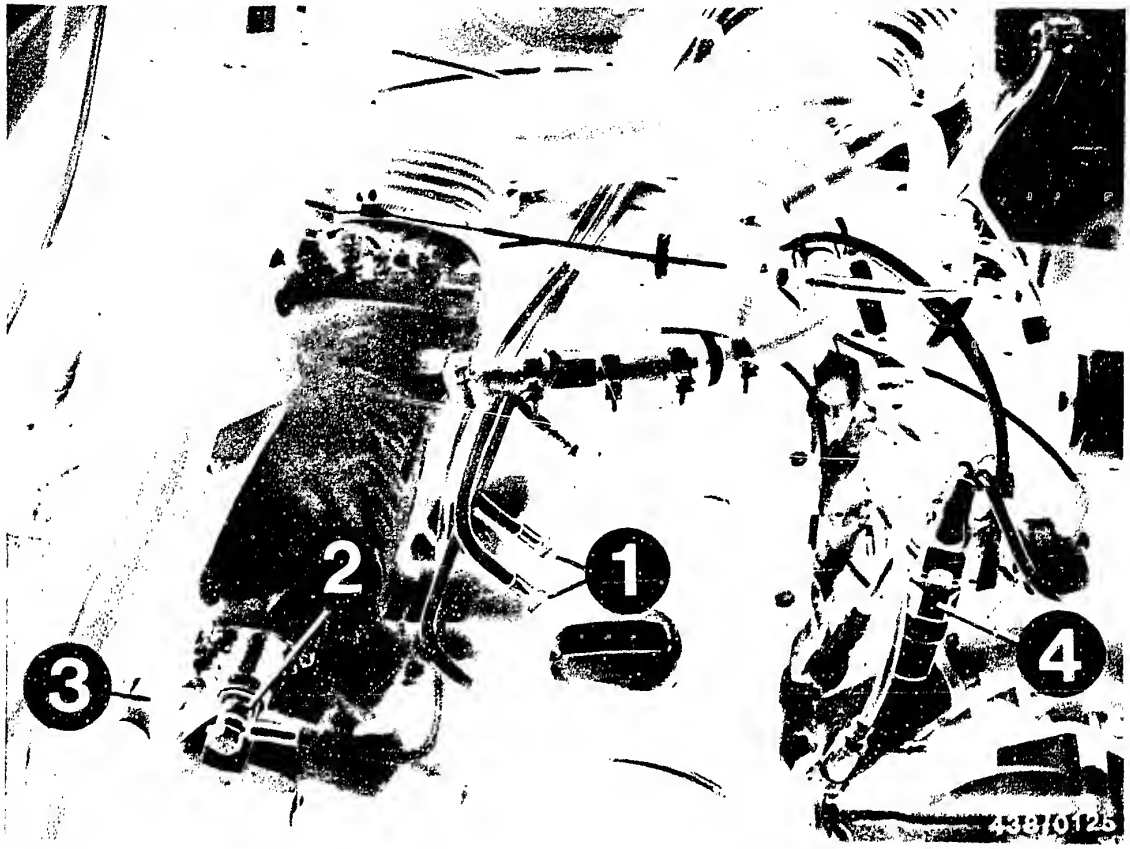
13.6 Removing and installing the electric fuel pump:

To do this, pinch off the fuel-intake hose from the fuel tank to the electric fuel pump (e.g. using hose clamper W 157 from Matra Co.).

- As of 1985 model

  The in-tank electric fuel pump with screwed-on pressure damper is accessible through a closure ring at the top on the fuel tank.

When installing, use a new seal and pay attention to the correct position of the electric fuel pump. Danger of bending the fuel lines.

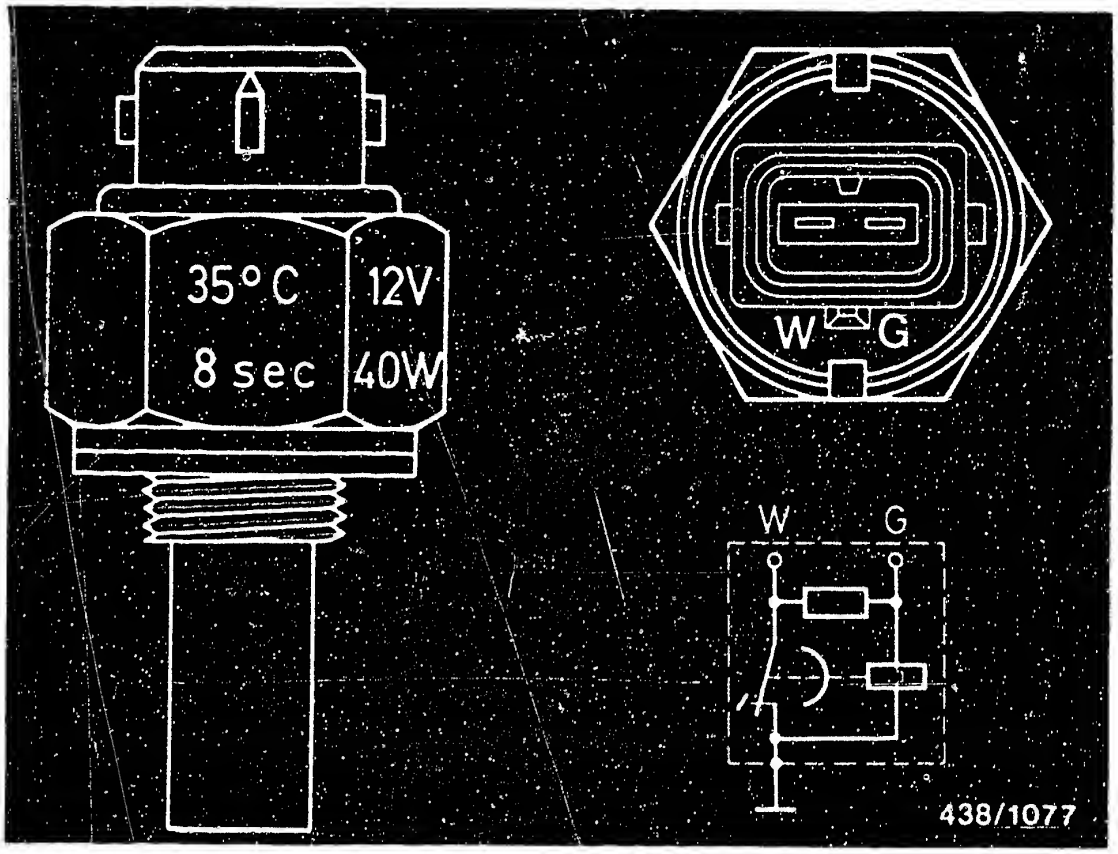


14. CHECKING THE COLD-STARTING SYSTEM AND COLD ACCELERATION EQUIPMENT

14.1 Thermo-time switch

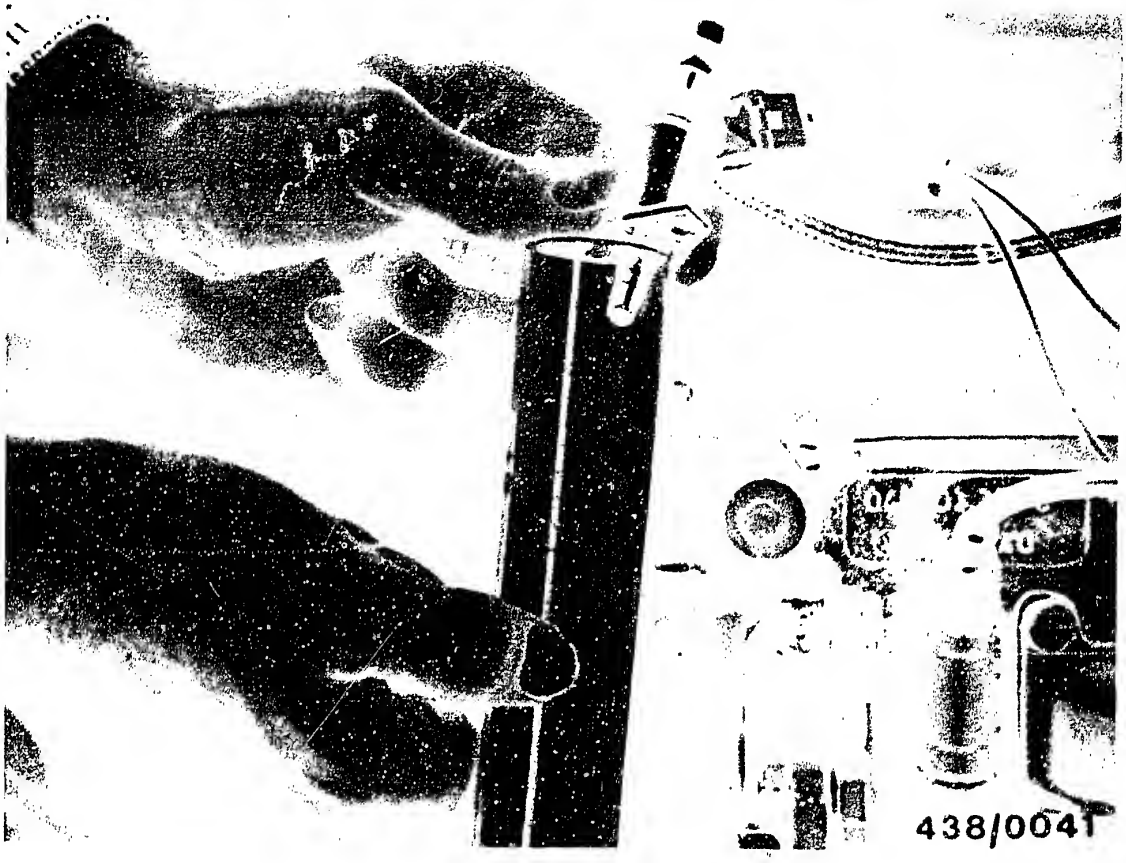
The thermo-time switch (Item 4) is screwed into the fitting in the coolant system.

For testing, remove the thermo-time switch.
Remove the connector.
Catch any escaping coolant in a suitable vessel.



The switching temperature +35°C and the switching time at -20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohm-meter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

		Resistance measurement (Ω) between		
At a temperature below °C	above °C	Term."G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+30		25...40	0	25...40
	+40	50...80	100...160	50...80



14.2 Start valve:

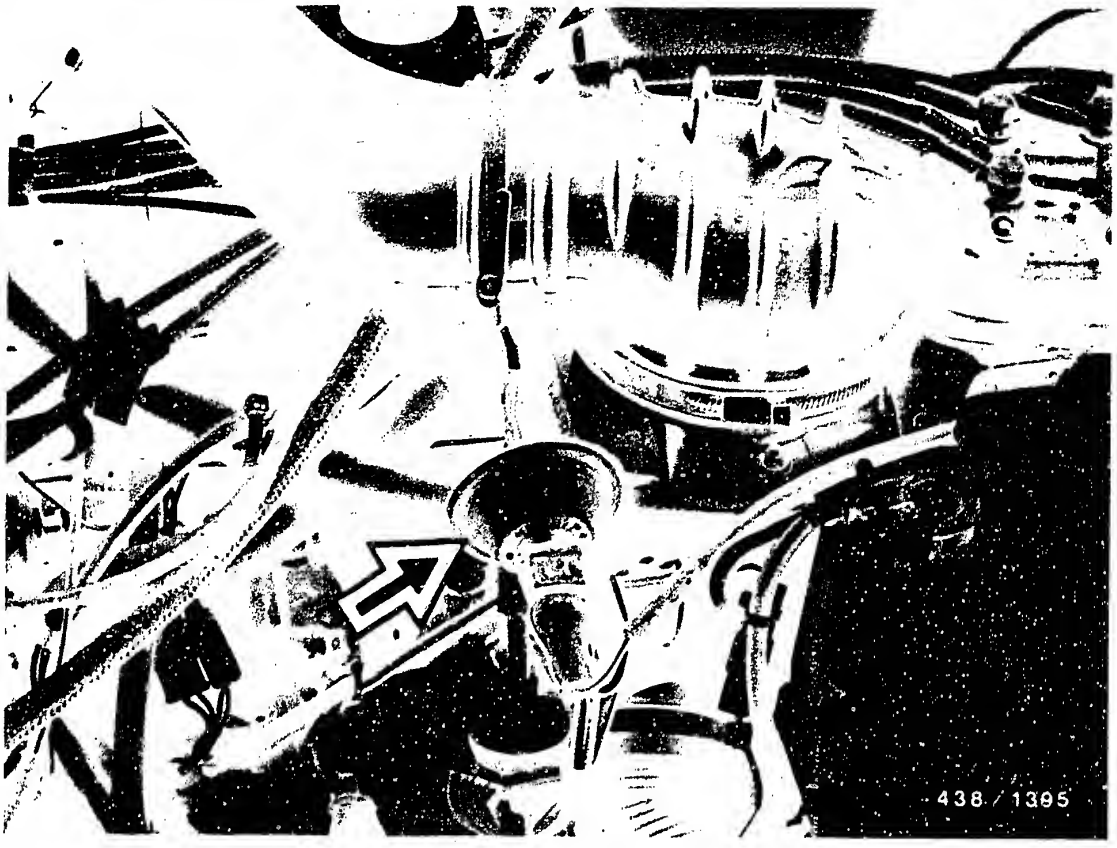
Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate). Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

C A U T I O N !

Never deflect (lift) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or it it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates G 1.



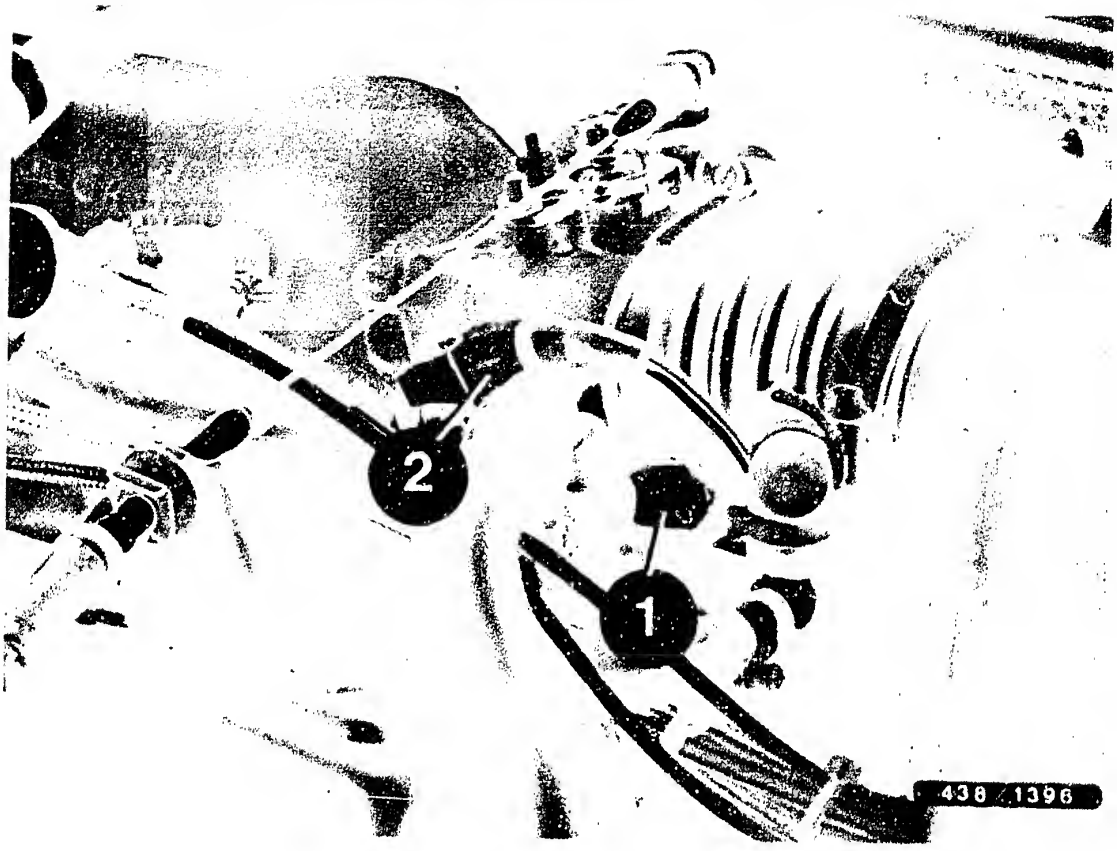
Arrow = Pressure-step switch

14.3 Cold acceleration enrichment (as of 1985 model)

At temperatures below +35° C, the start valve briefly injects fuel into the intake manifold when accelerating.

- Pressure-step switch

  Disconnect plug; connect multimeter to pressure-step switch and select resistance measuring range.
  Let engine idle - reading ∞Ω.
  With burst of throttle - reading briefly 0Ω.
  If not, replace pressure-step switch.



1 = Throttle-valve switch
2 = Plug

- Throttle-valve switch

  Disconnect plug. Connect multimeter to throttle-valve switch plug and select resistance measuring range.

  With throttle valve in idle position - reading $\infty\Omega$.
  Deflect throttle valve - reading 0Ω.
  If not, replace throttle-valve switch.

15. Checking the control pressures

15.1 Preliminary remarks:

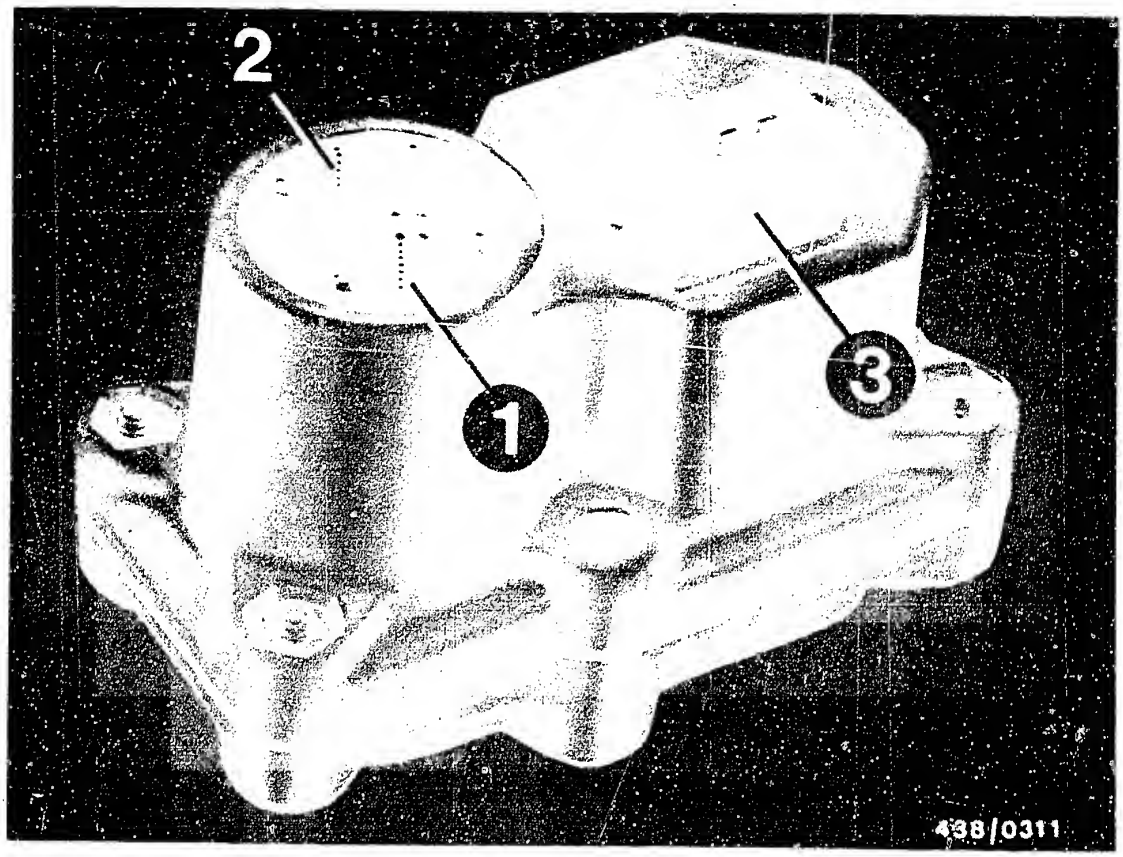
The control pressures tested in the following are basically governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector. Minimum voltage = 11.5 V.
- Fuel return from the warm-up regulator blocked or constricted.
- Too low or too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Test specification: 160...240 cm^3/min

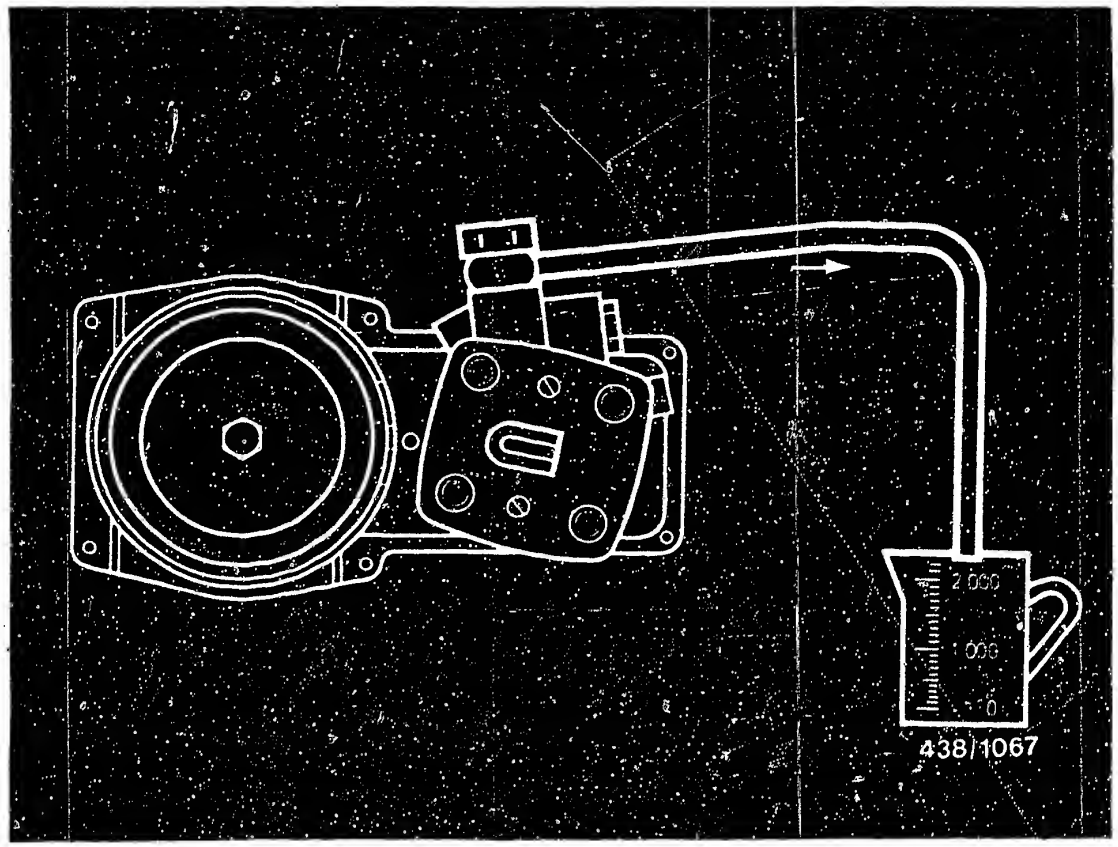
Reference is made to the other possible causes of trouble in the respective test step.



1 = Intake port (M 10 x 1)
2 = Return port (M 8 x 1)
3 = Electrical connection

15.2 Design of warm-up regulator

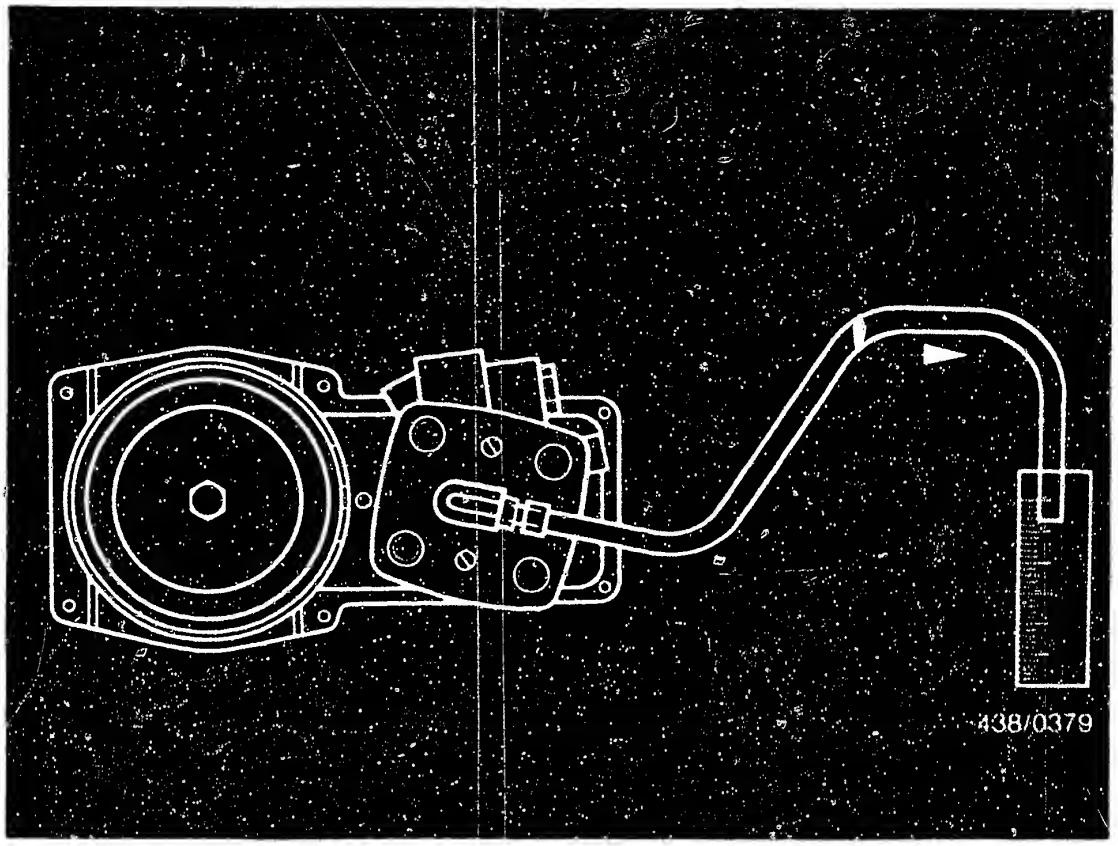
Warm-up regulator 0 438 140 011/073/074/118/119
The warm-up regulator corresponds to the standard design, i.e. apart from control pressure "cold" and "warm" no other functions (such as full-load and altitude compensation) are performed.



15.3 Testing the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating correctly.
Test specification: Min. 750 cm^3/30 sec.

As the measuring point use the screw connector in the fuel return line to the fuel tank.



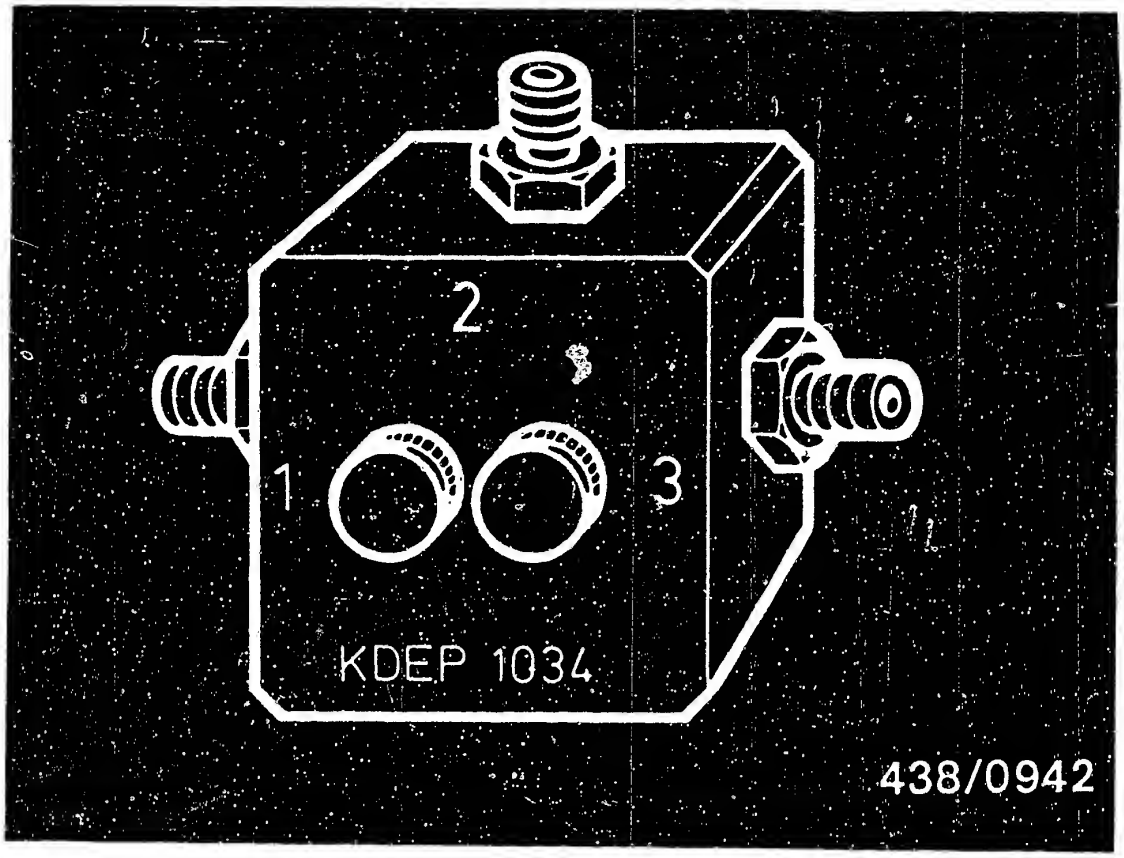
Connect one of the two connecting hoses of the pressure tester KÖJE-P 100 (previously KDEP 1034) to the control-pressure port of the fuel distributor (threads M 12 x 1.5) and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

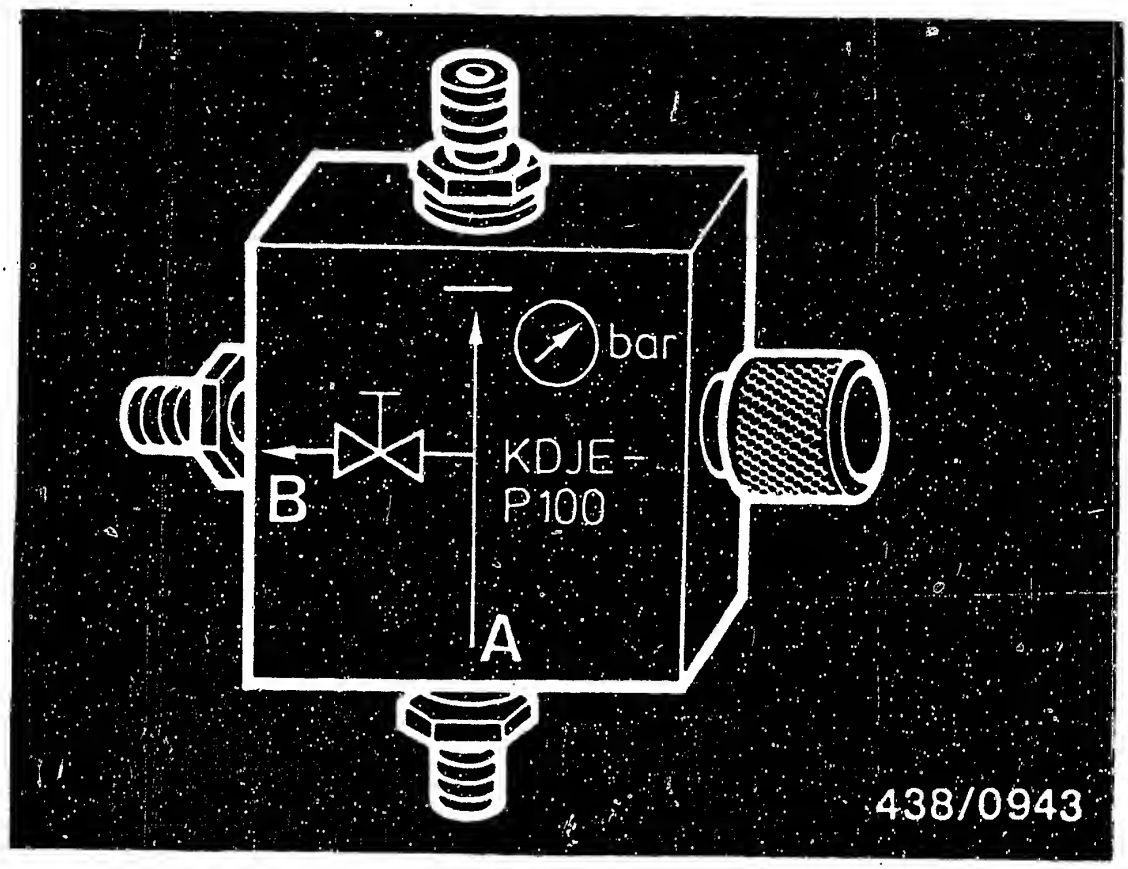
If the measured value is outside tolerance, the fault is in the fuel distributor.

Replace the fuel distributor.



15.4 Mounting the pressure tester KDJE-P 100 (Previously KDEP 1034):

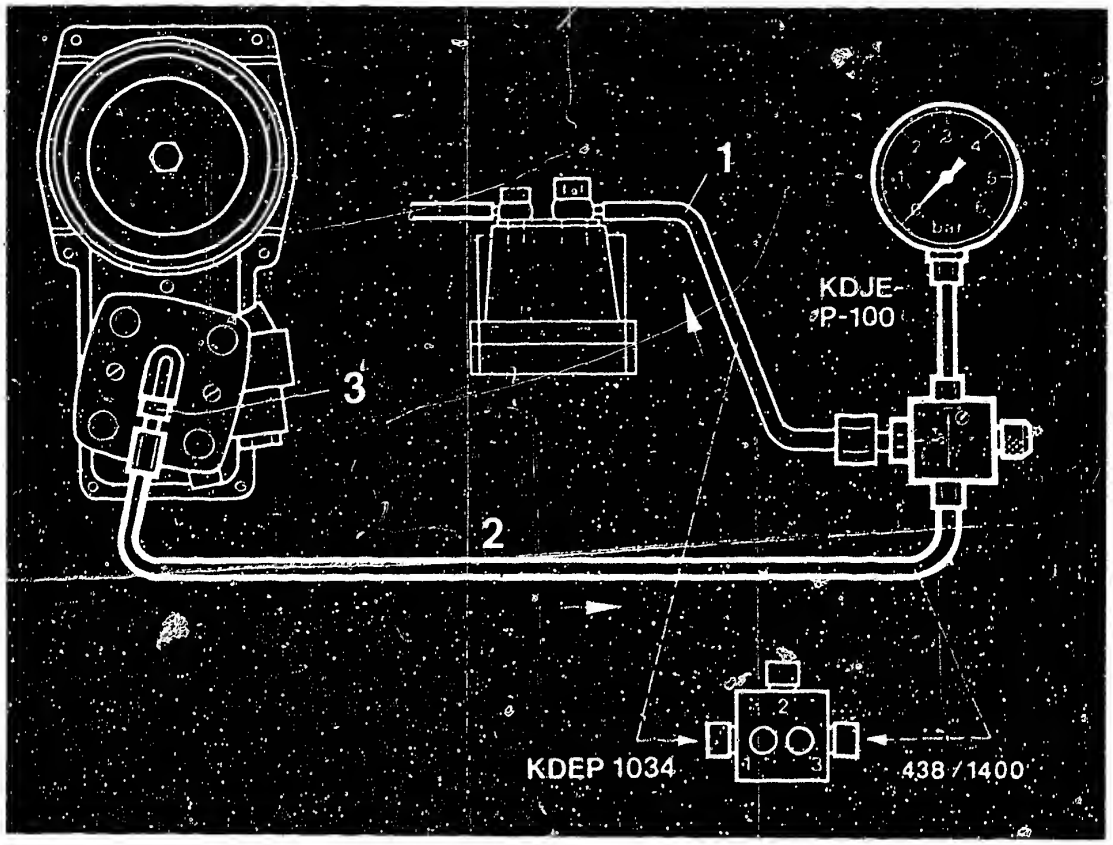
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate hollow screws. The connections on the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

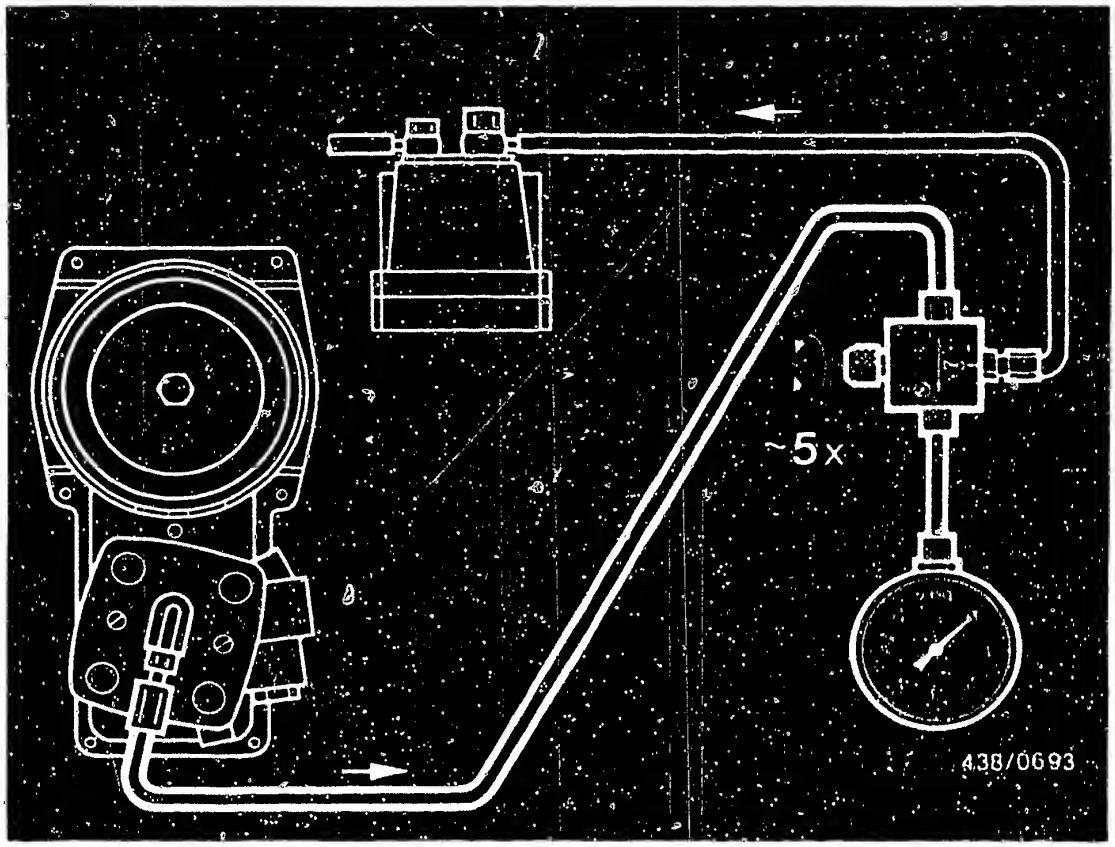
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) on the fuel distributor and connect to outlet fitting B or 1 of the directional-control valve.

Connect the hose line (2) of the pressure tester to the control-pressure connection port (3) of the fuel distributor.



15.5 Bleeding the pressure tester:

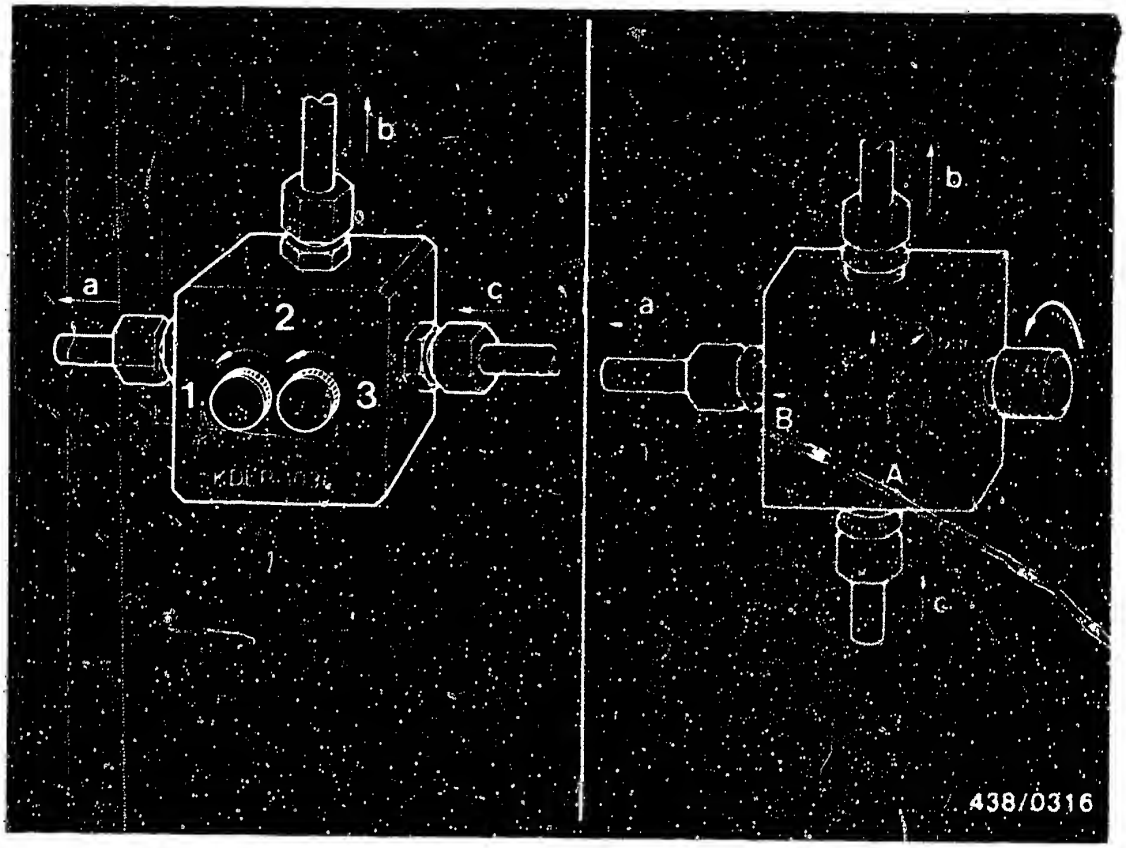
Disconnect plugs from warm-up regulator and auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

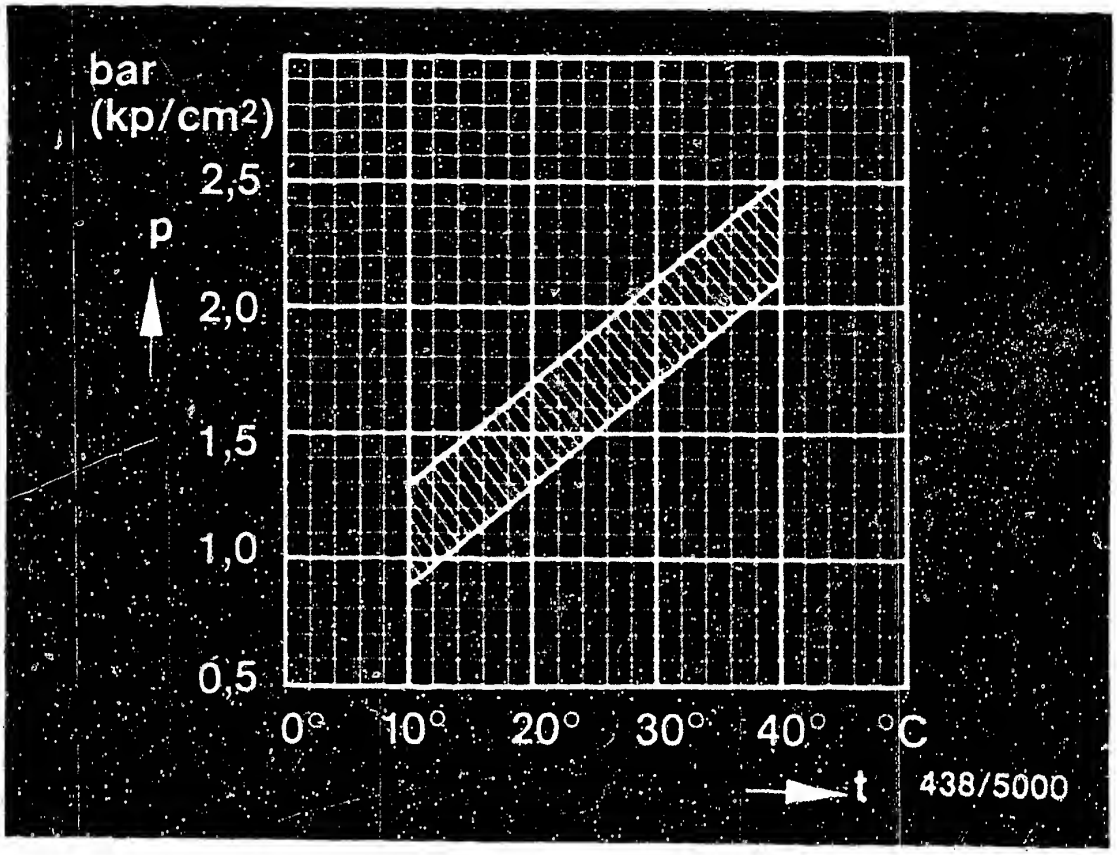
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.6 Testing the "cold" control pressure:

The test is performed with the engine switched off.
The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.
The pressure gauge now indicates the "cold" control pressure.

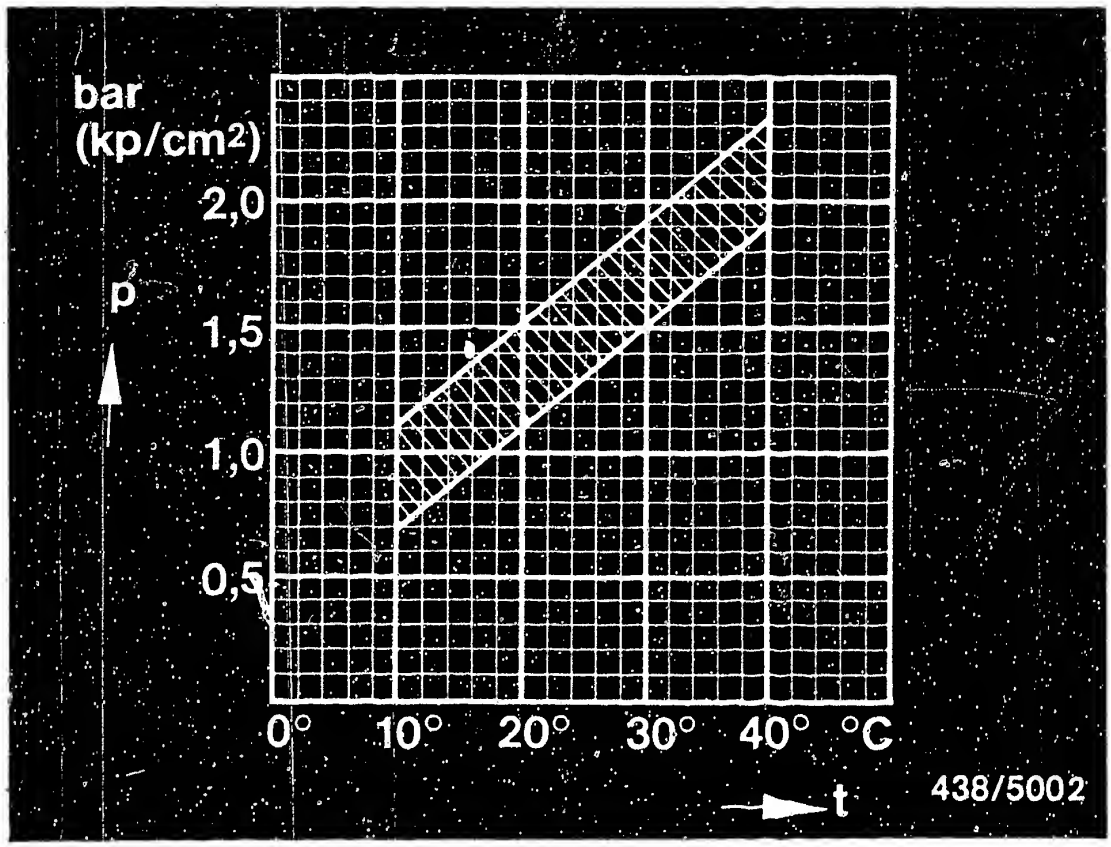


p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

- Warm-up regulator Part No.: 0 438 140 011

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20°C
Nominal control pressure = 1.1... 1,7 bar gauge pressure



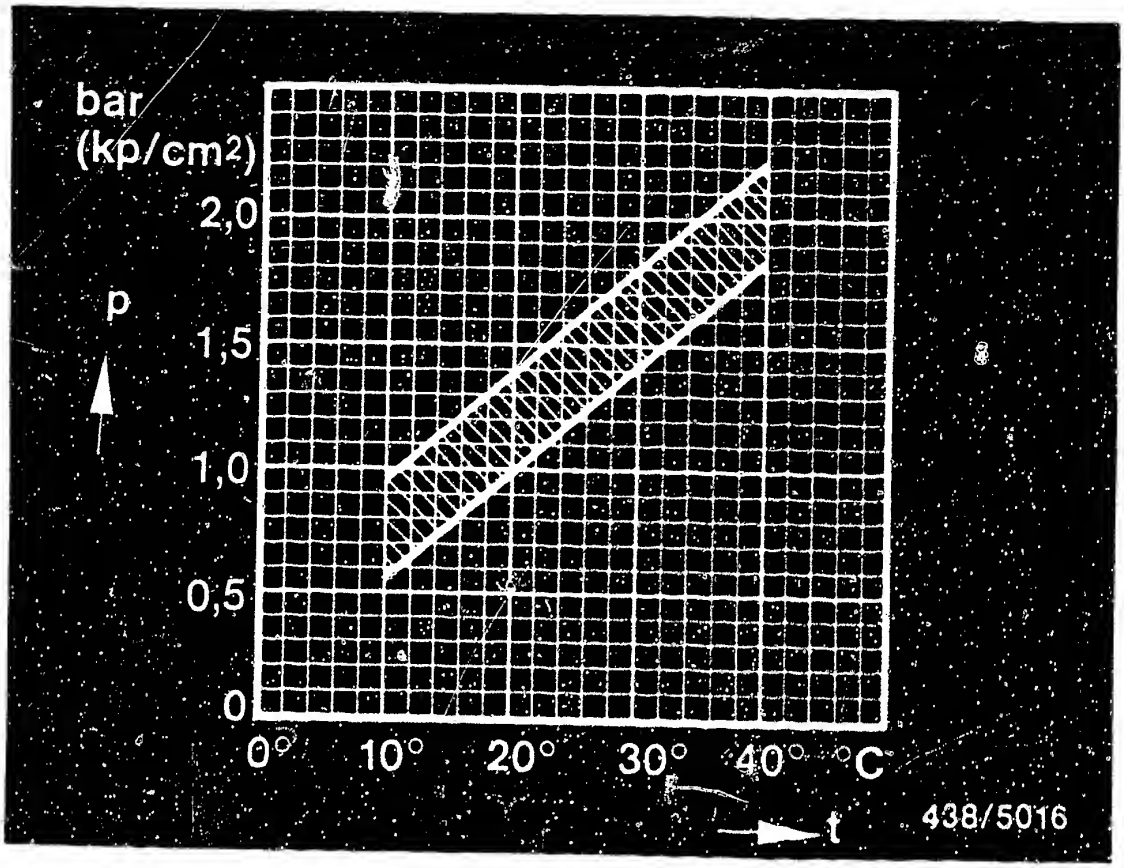
p = Control pressure (gauge pressure)
t = Ambient temperature

- Warm-up regulator 0 438 140 073
  0 438 140 074

Basic version

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20 °C
Nominal control pressure = 1.1...1.5 bar (gauge pressure)



p = Control pressure (gauge pressure)
t = Ambient temperature

- Warm-up regulator part number: 0 438 140 118
  0 438 140 119

  Basic version of warm-up regulator

  Using the graph, determine the set value for the control pressure according to the ambient temperature.

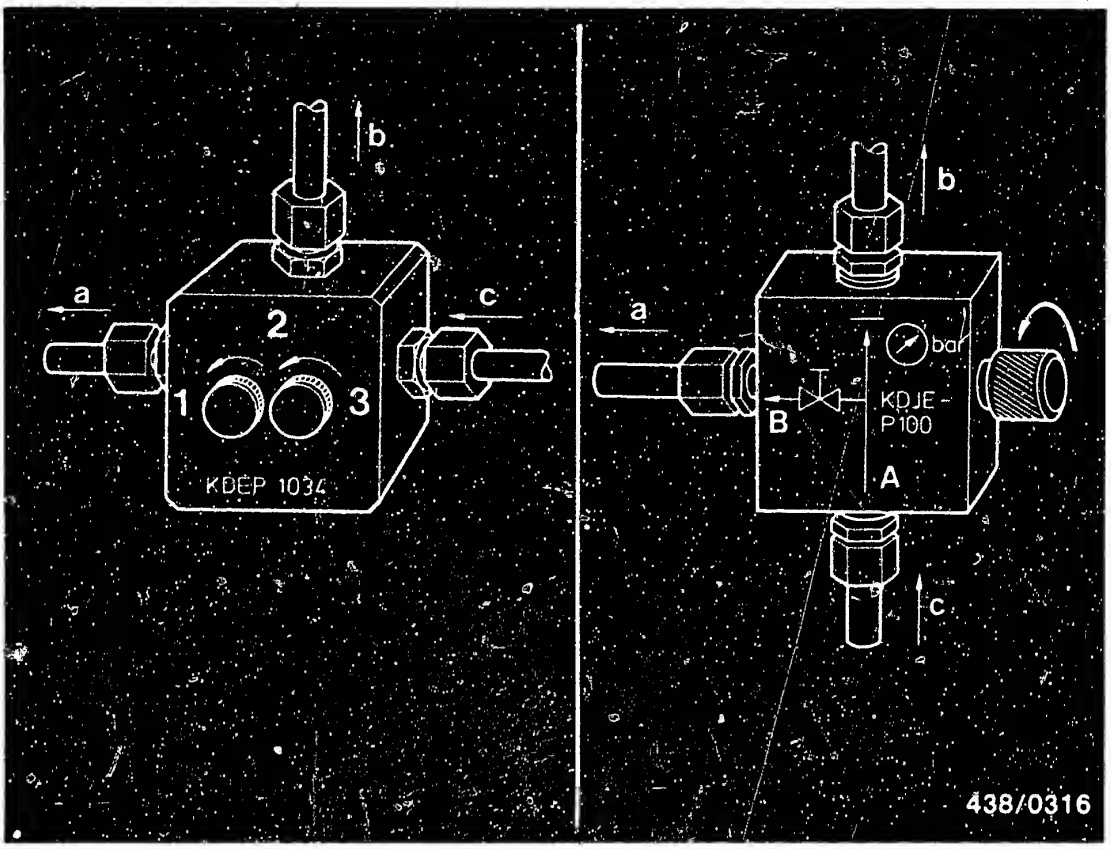
  Example: Ambient temperature = 20°C
  Set value for control pressure = 1.0...1.4 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control pressure circuit too low or too high. Test fuel delivery.
  Test value: 160...240 cm^3/min.
- Fuel return (possibly push valve) from warm-up regulator blocked or constricted (if control pressure too high).
- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator was replaced or a fault was found, the idle speed must then be set with the engine at operating temperature.

The idle adjustment procedure is explained at coordinates G 1.



a = to warm-up regulator
b = to pressure gauge
c = from fuel distributor

15.7 Checking the "warm" control pressure

Warm-up regulator: 0 438 140 011
0 438 140 073
0 438 140 074
0 438 140 118
0 438 140 119

The test is carried out with the engine switched off.
The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electric safety circuit.

• Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test specification for "warm" control pressure:
3.4...3.8 bar gauge pressure
(3.5...3.9 kgf/cm² gauge pressure)

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

• Fuel delivery for the control-pressure circuit too high.
Test fuel delivery.
Test specification: 160...240 cm³/min.

• Fuel return from the warm-up regulator blocked or constricted.
Eliminate constriction.

• Warm-up regulator has hydraulic defect.
Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

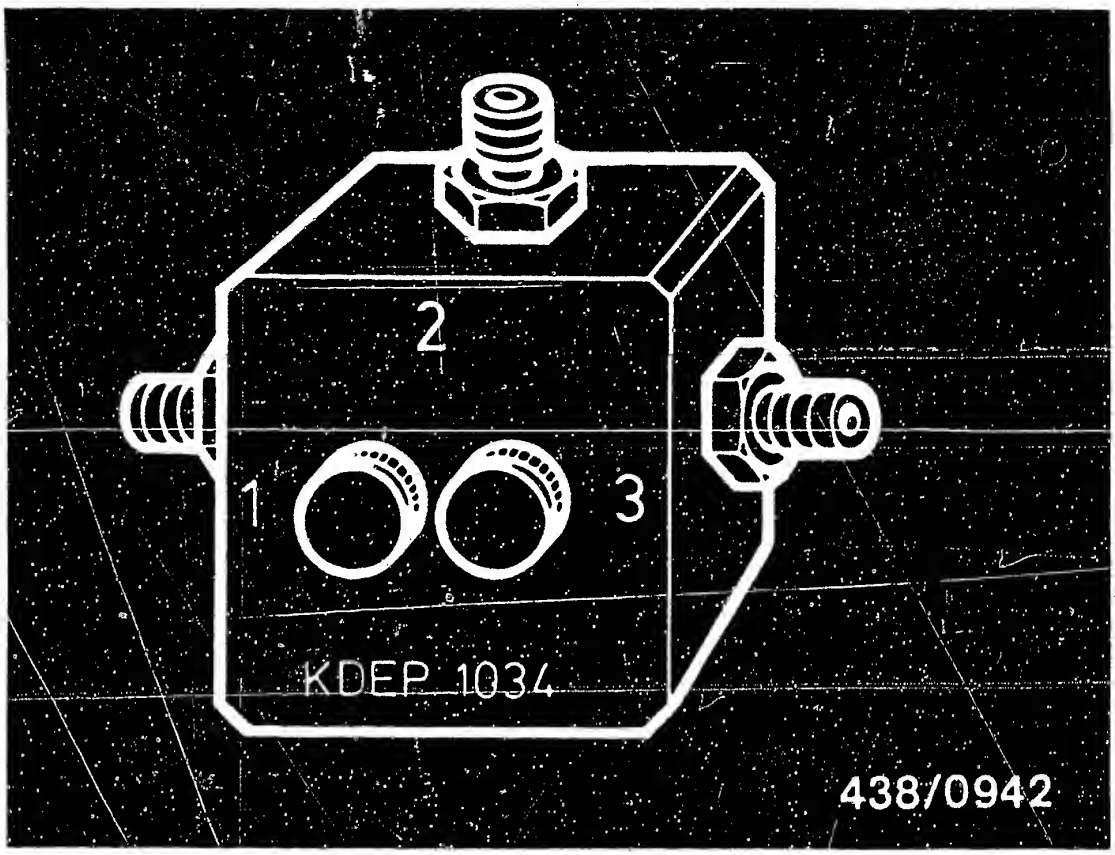
- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low. Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

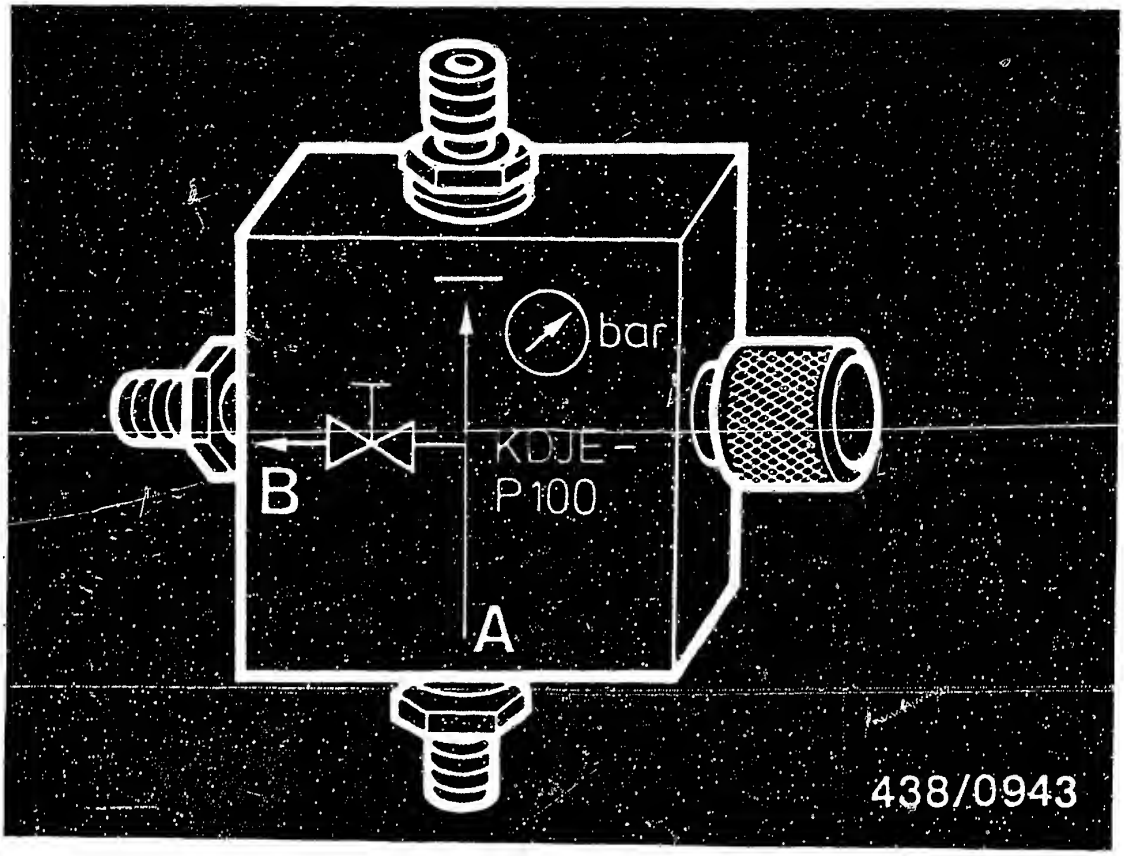
Idle adjustment is described on Coordinates G 1.



16. Testing and adjusting the primary (system) pressure:

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

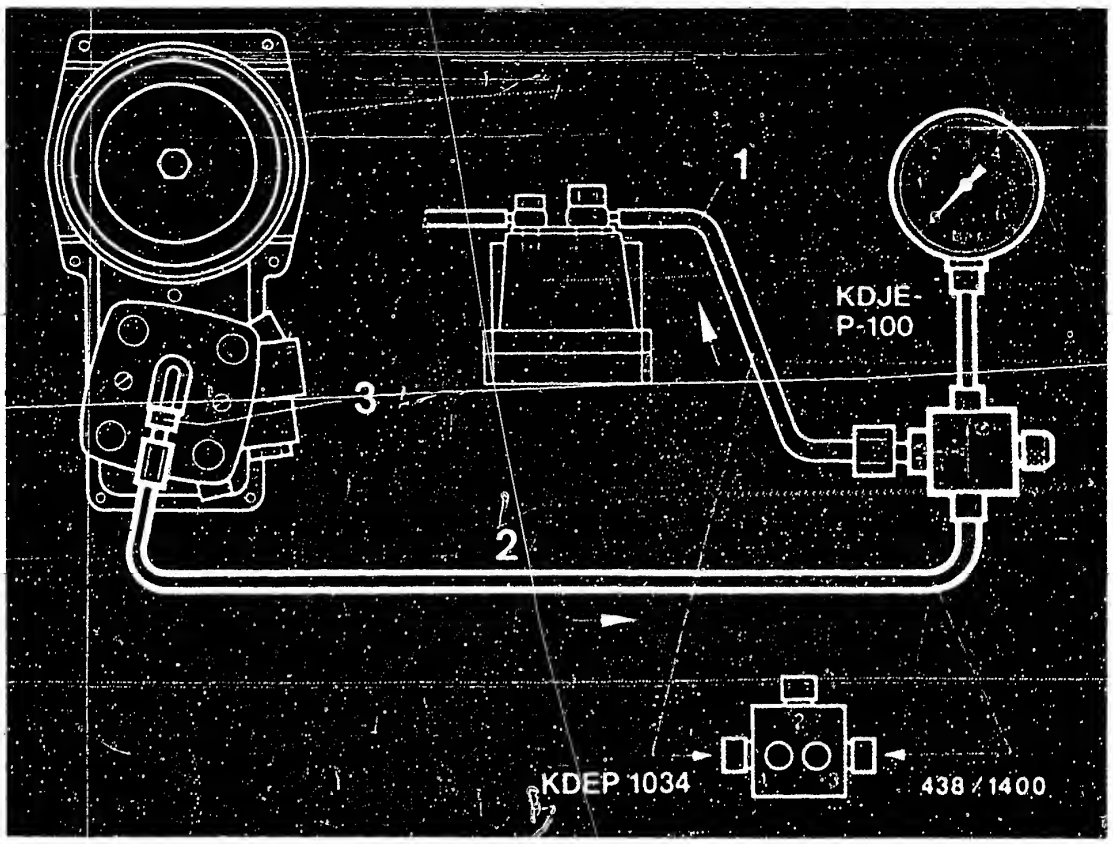
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

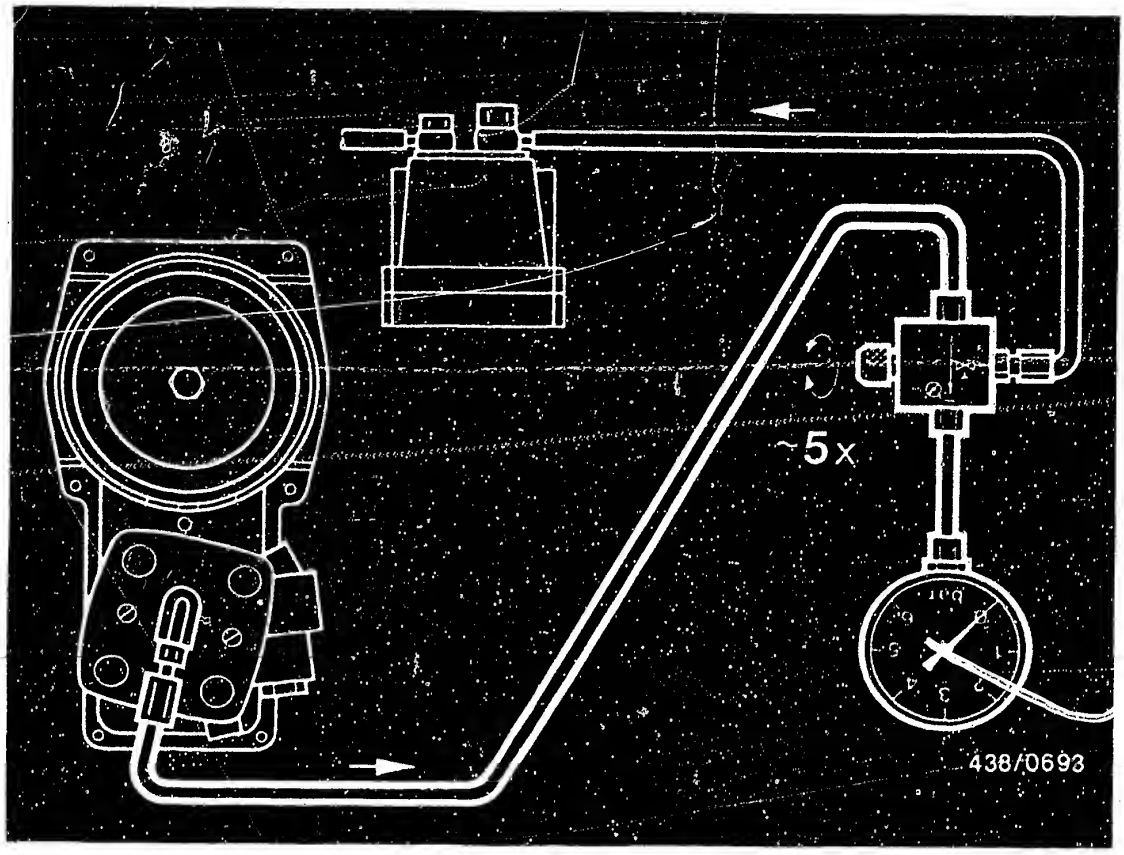
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 of the directional-control valve.

Connect the hose line (2) of the pressure tester to the control-pressure connection port (3) of the fuel distributor.
Suspend the pressure gauge from the hood (possibly using a wire hook).



16.2 Bleeding the pressure tester:

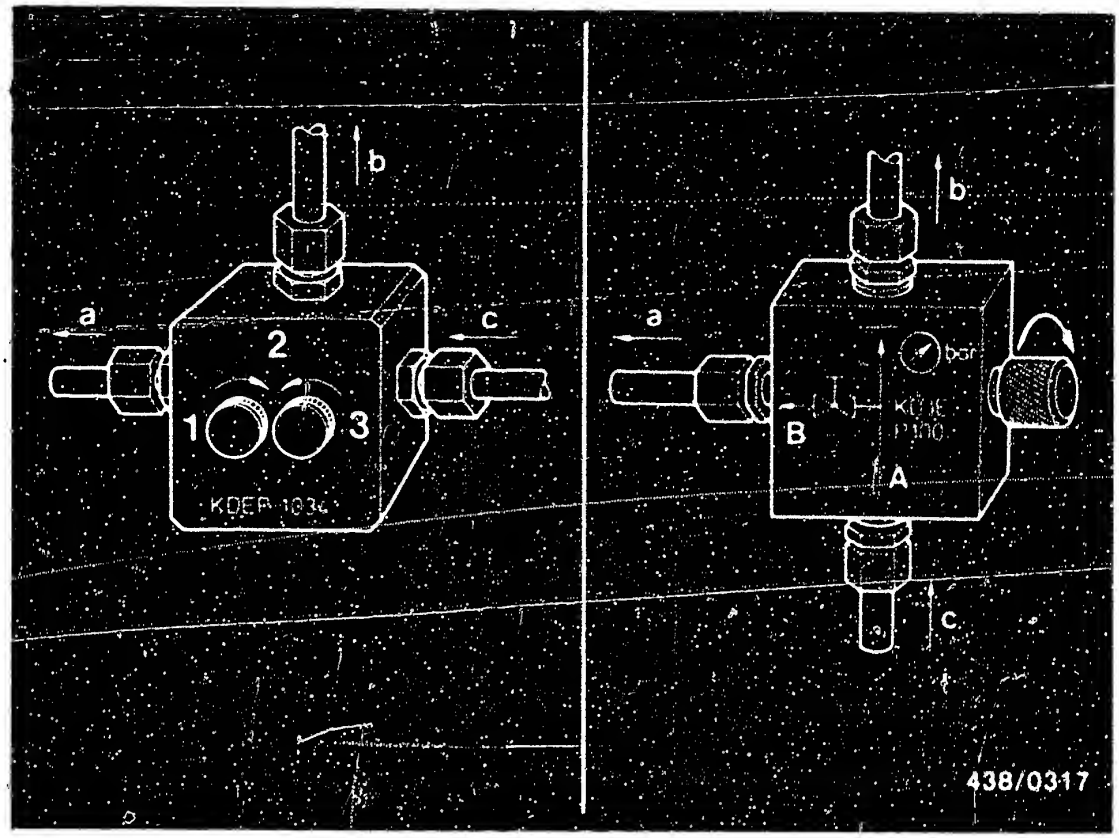
Disconnect plugs from warm-up regulator and auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Testing the primary pressure:

The test is performed with the engine switched off.
The temperature of the engine is not important.
Close the valve screw of directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.
The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 005	4,5...5,2 bar (4,6...5,3 kp/cm³)
0 438 100 059 } 0 438 100 079 } 0 438 100 100 }	4.7...5.4 bar (4.8...5.5 kgf/cm²)

Possible causes for too low a primary pressure:

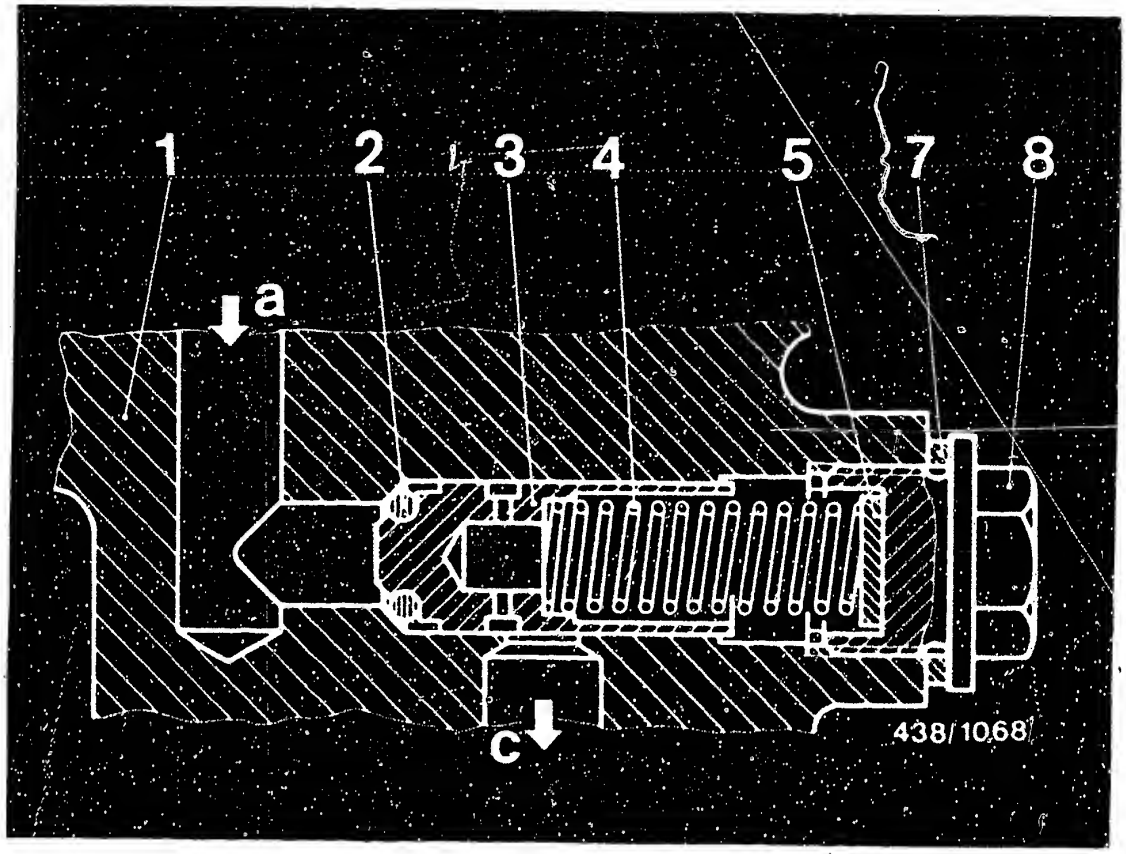
- Fuel supply faulty.
  (Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
  Measure the fuel delivery.
  Test specification: 750 cm³/30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.
  For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.

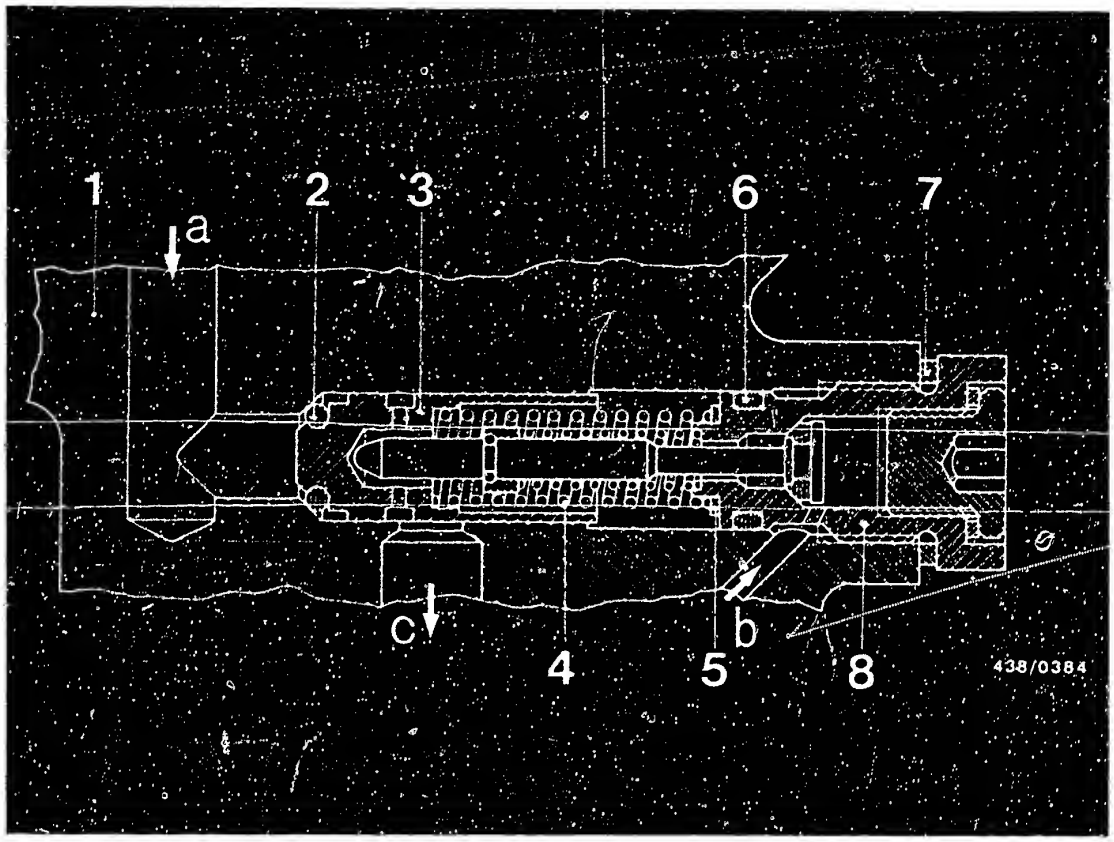


a = Primary pressure
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
7 = Flat seal ring
8 = Screw plug

- The diagram shows fuel distributor 0 438 100 005 (Without push valve)

16.4 Adjusting the primary pressure:

Fuel distributor Part No.	Adjustment values - primary pressure (gauge pressure)
0 438 100 005	4.7...4.9 bar (4.8...5.0 kgf/cm²)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug .

- The diagram shows a fuel distributor with push valve

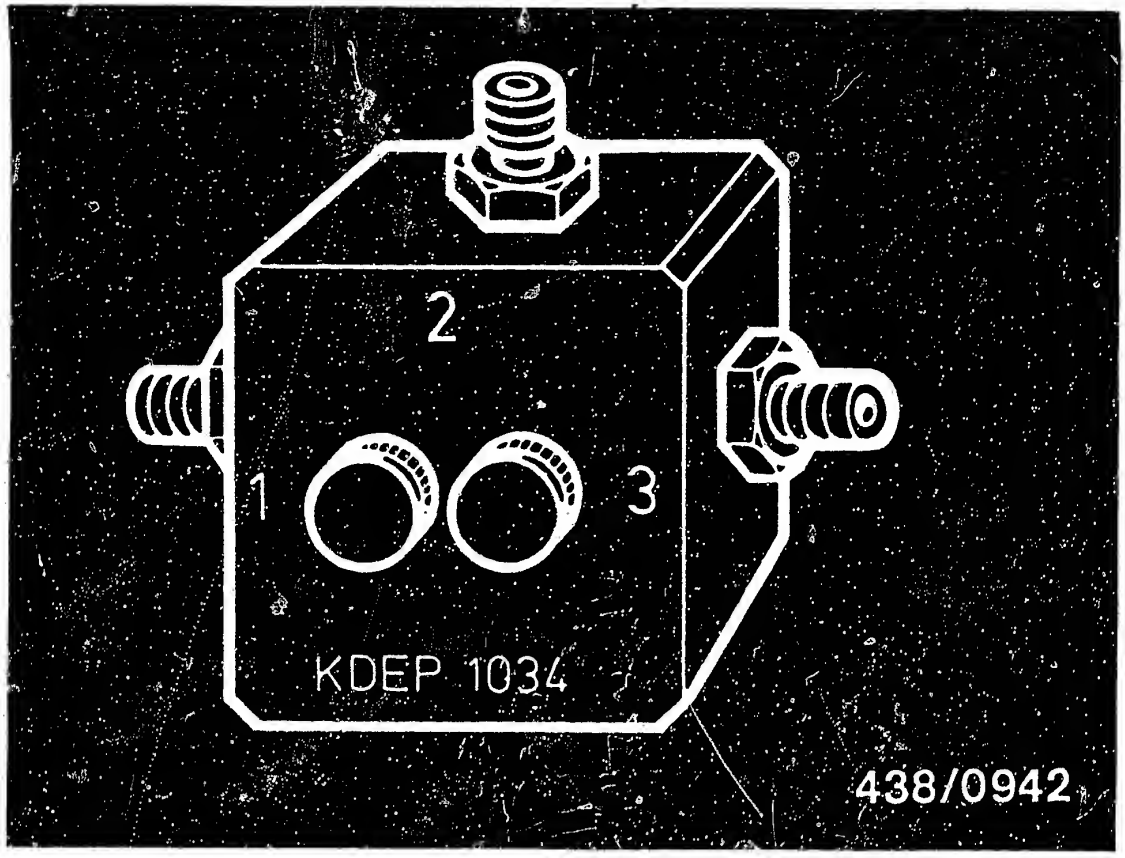
Fuel distributor Part No.	Test specifications- Primary pressure (gauge pressure)
0 438 100 059 0 438 100 079 0 438 100 100	4.9...5.1 bar (5.0...5.2 kgf/cm²)

The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

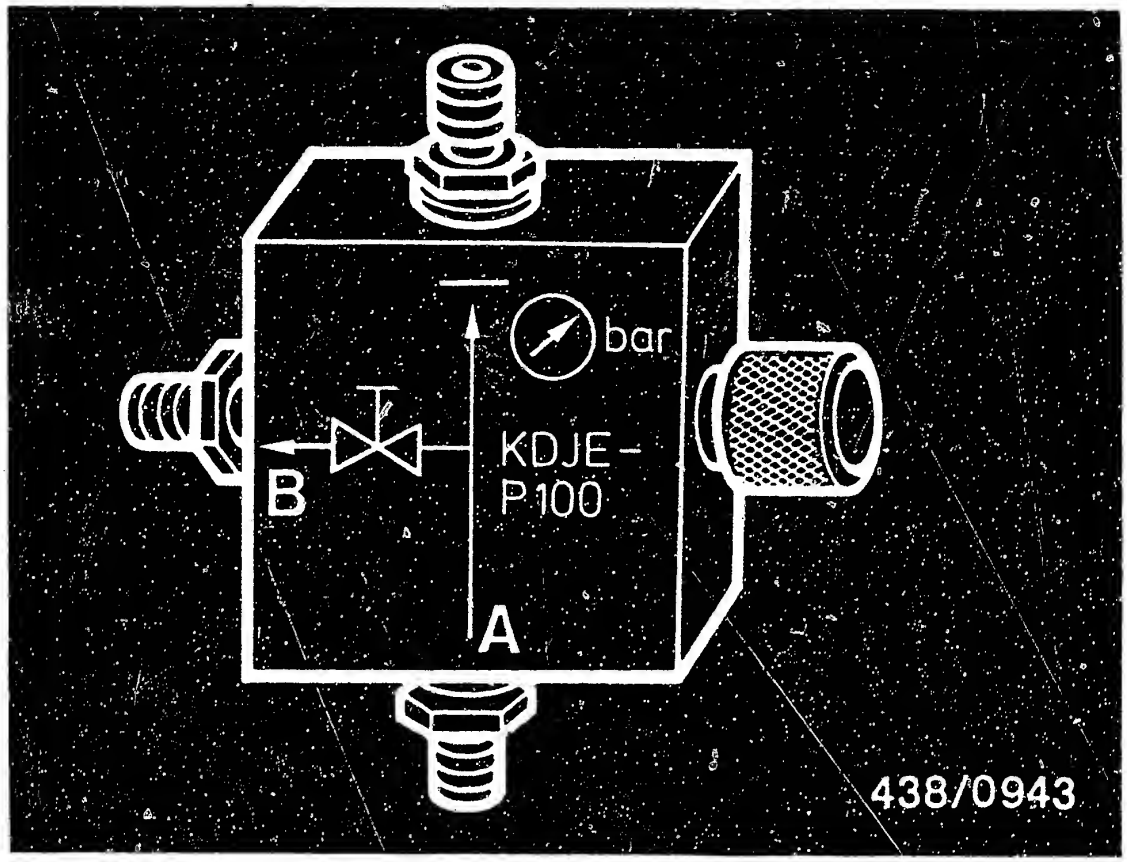
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



17. Testing and adjusting the primary (system) pressure:

17.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

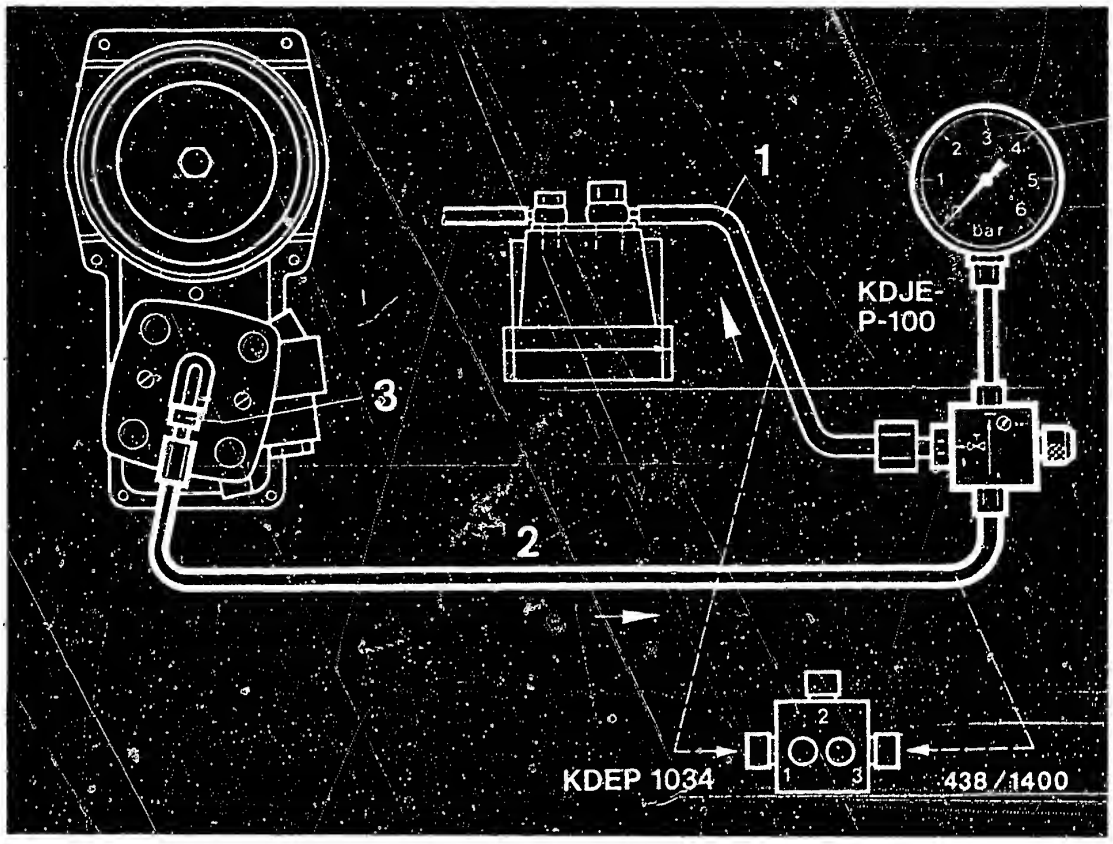
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

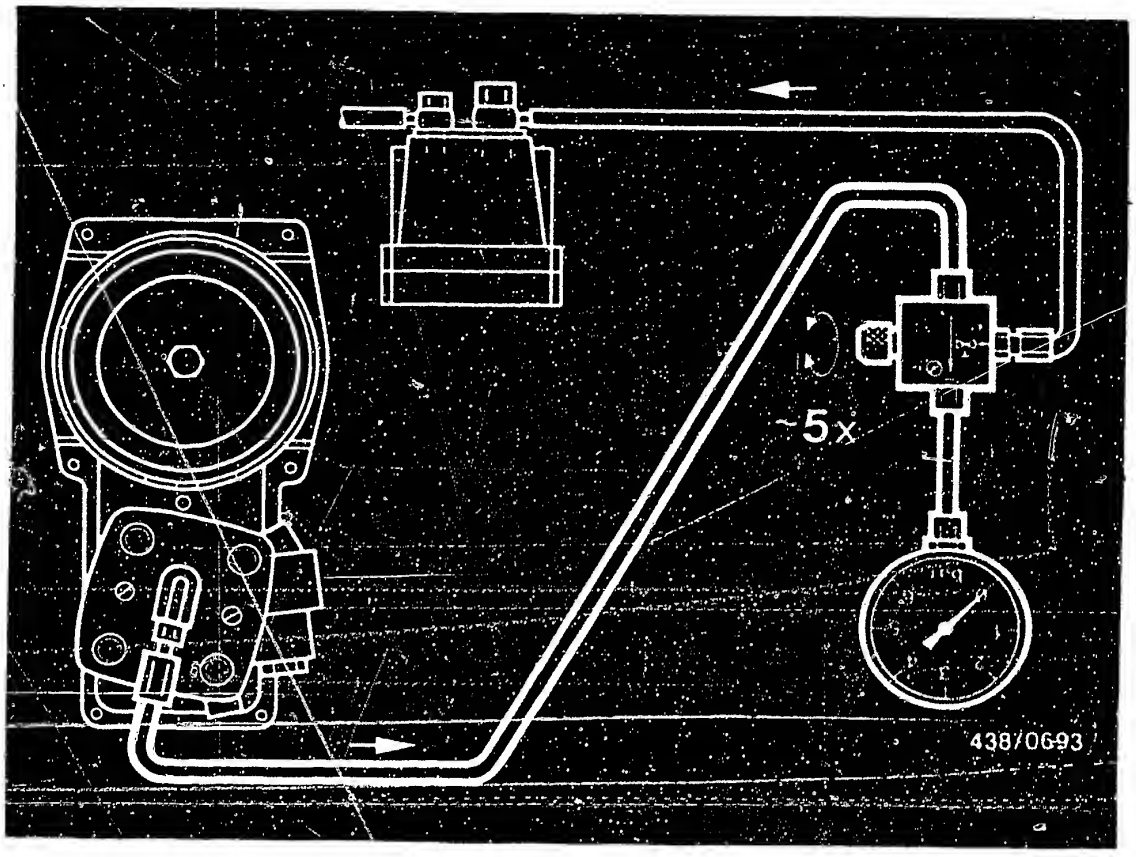


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 of the directional-control valve.

Connect the hose line (2) of the pressure tester to the control-pressure connection port (3) of the fuel distributor.

Suspend the pressure gauge from the hood (possibly using a wire hook).



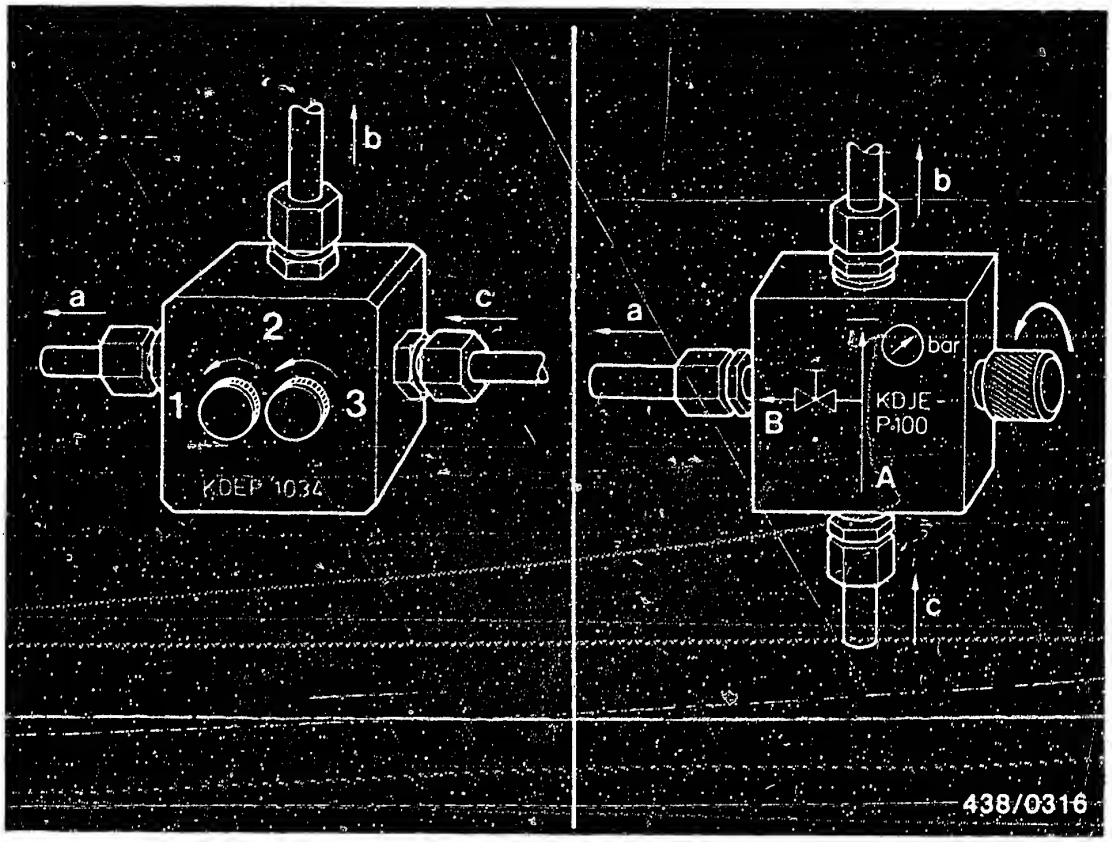
17.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

17.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.

Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

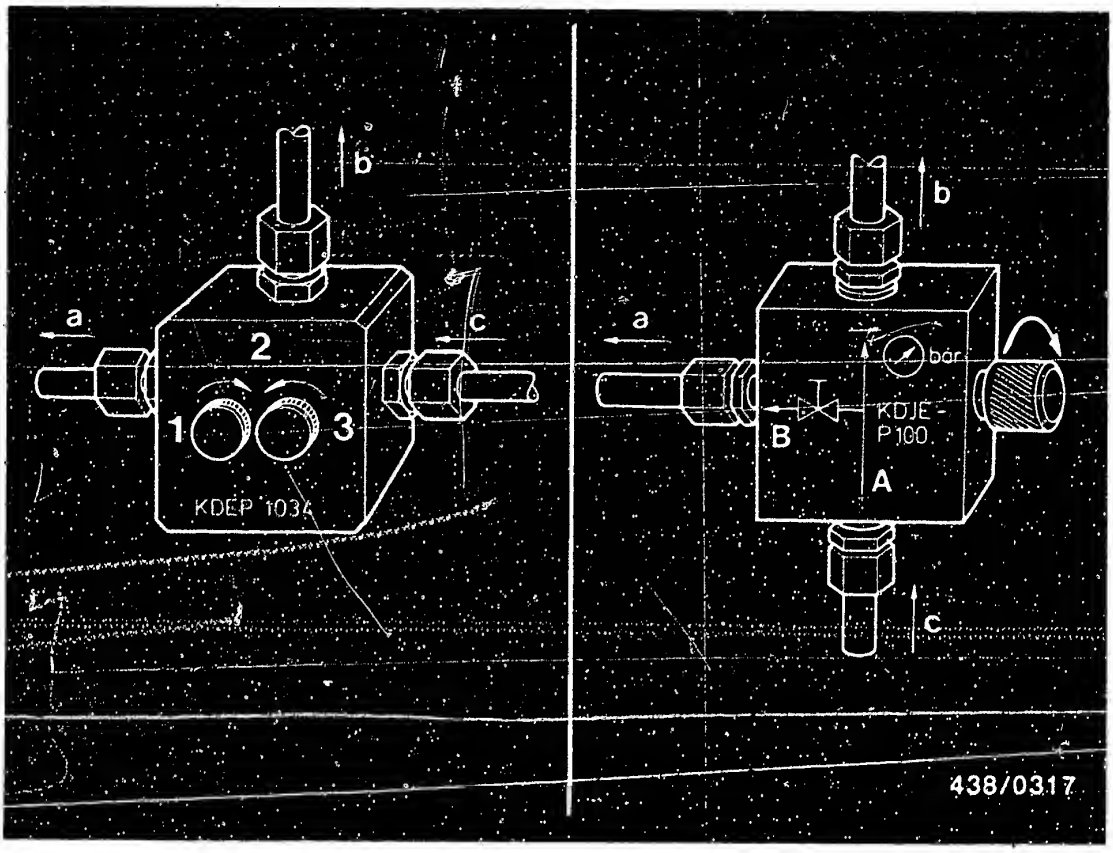
Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test*

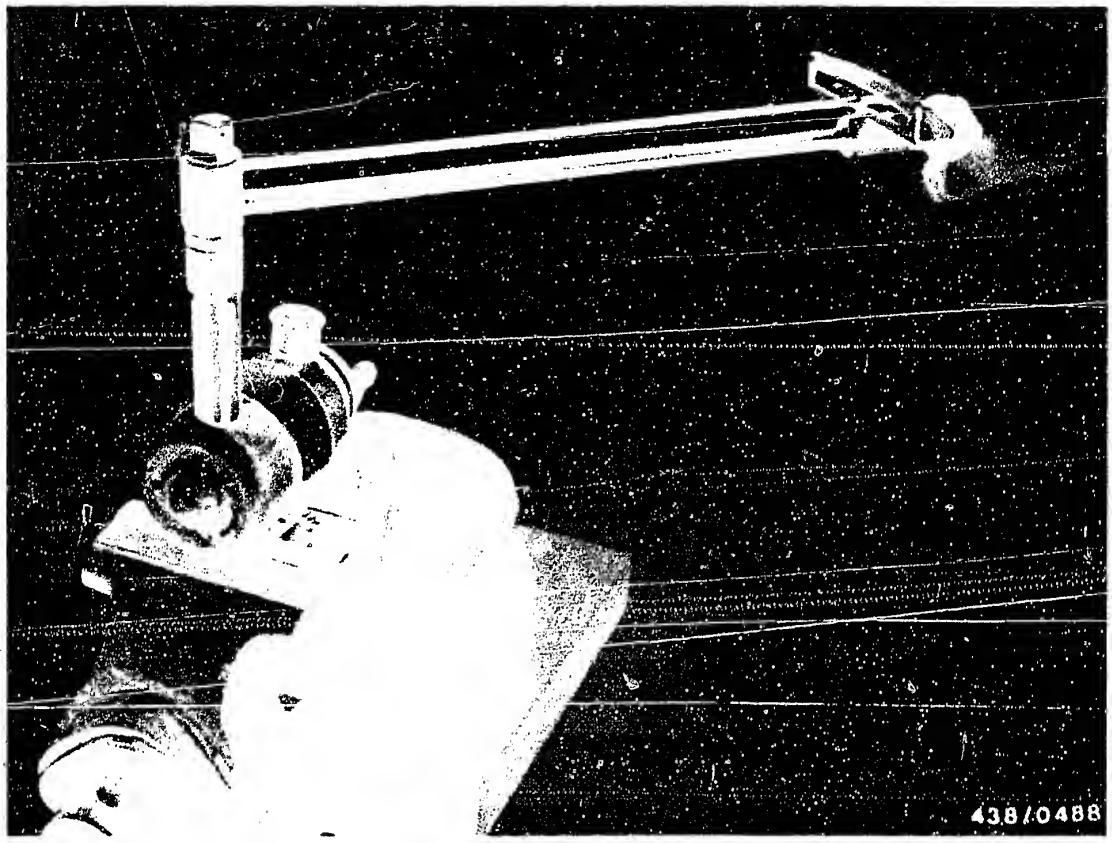
	For fuel accumulator part no. 0 438 170 027 / up to FD 931	0 438 170 028 as of FD 932	0 438 170 010/ 011 0 438 170 019/ 020
		0 438 170 040/ 041	
	up to FD 931 (identified by blue dot)	from FD 932	
Minimum pressure after 10 minutes:	2.2 bar (2.3 kgf/cm²)	2.5 bar (2.6 kgf/cm²)	2.0 bar (2.1 kgf/cm²)
20 minutes:	2.0 bar (2.1 kgf/cm²)	2.4 bar (2.5 kgf/cm²)	1.7 bar (1.8 kgf/cm²)

* Pressures are given in bar (kgf/cm²) gauge pressure.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.
Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.
If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



17.4 Possible causes of trouble in the primary-pressure circuit

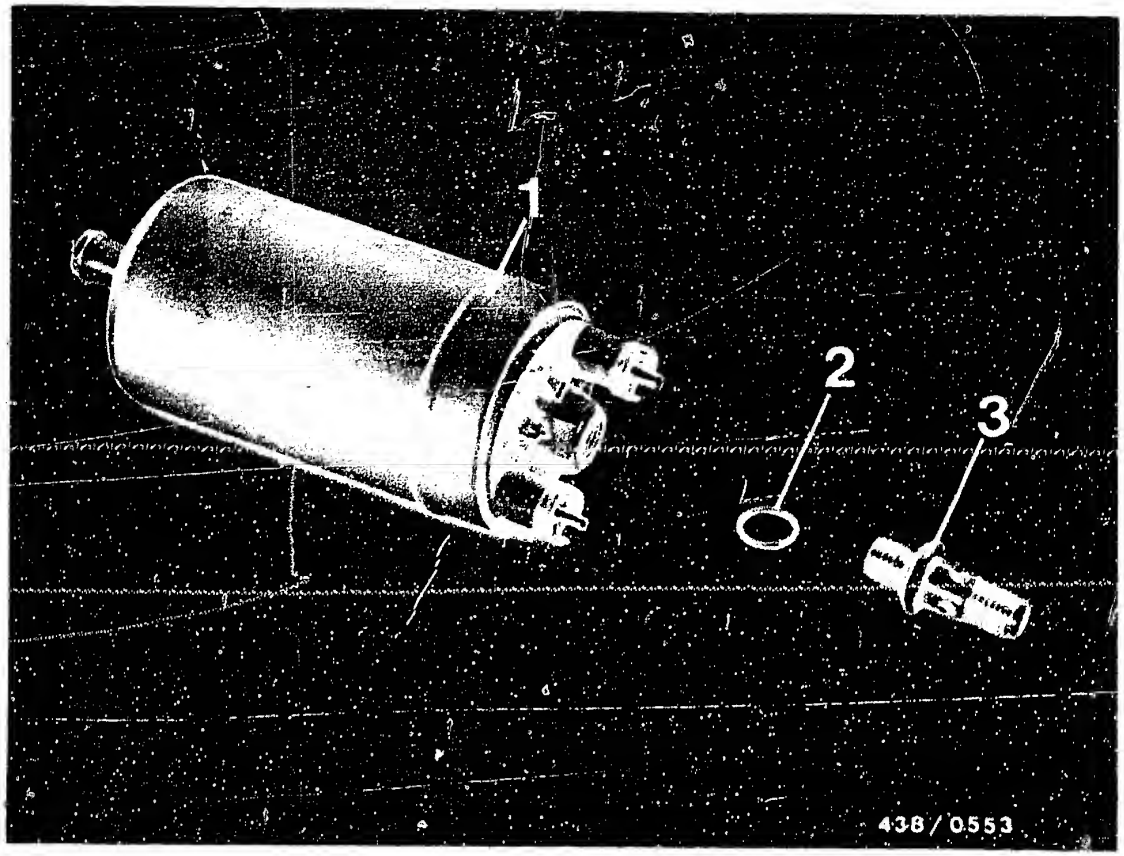
- Non-return valve in tube fitting of electric fuel pump leaking.
  Electric fuel pump part no. 0 580 254 992
  (Date of manufacture 6.76 - 5.77)

  Pump type EKP I with steel housing and lateral tube fitting.
  The non-return valve is integrated in the tube fitting.

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Screw off the delivery line, collecting any escaping fuel.
Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

Check connections for leaks with the electric fuel pump in operation.

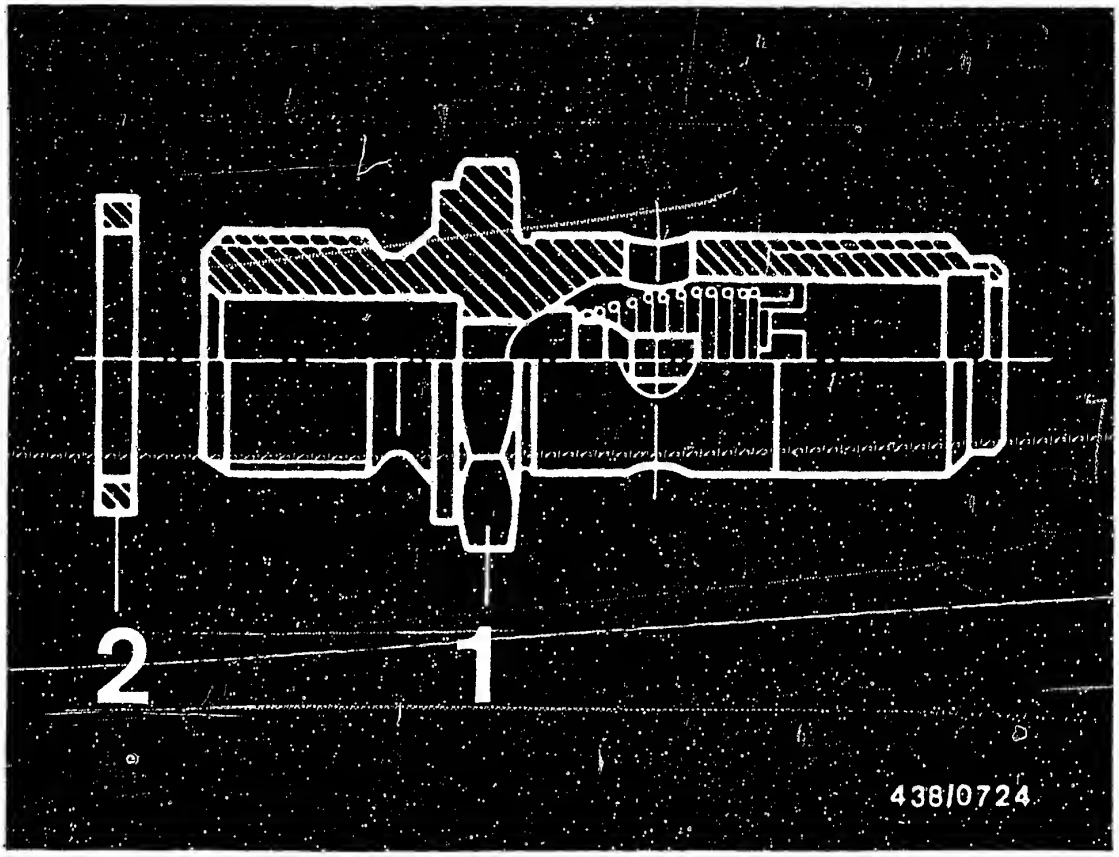


1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

Electric fuel pump (as of 6.77 date of manufacture) with part no.:

0 580 254 957/958
0 580 254 961/962
0 580 254 980/981

Pump type EKP IV with aluminum housing and axial tube fitting.
The non-return valve is integrated in the tube fitting.



1 = Tube fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 002

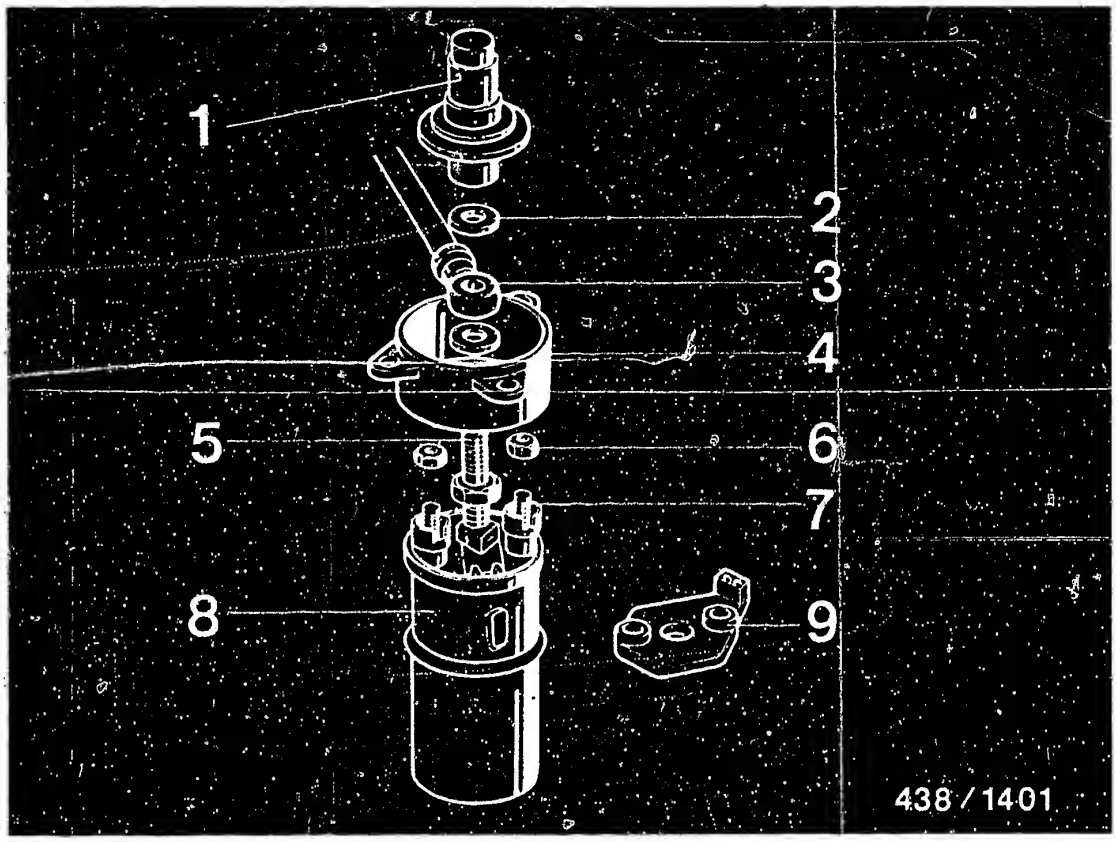
If necessary, replace tube fitting from parts set 1 587 010 002 as follows:

Installation:

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Screw off the delivery line, collecting any escaping fuel.
Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece.
Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

Check connections for leaks with the electric fuel pump in operation.

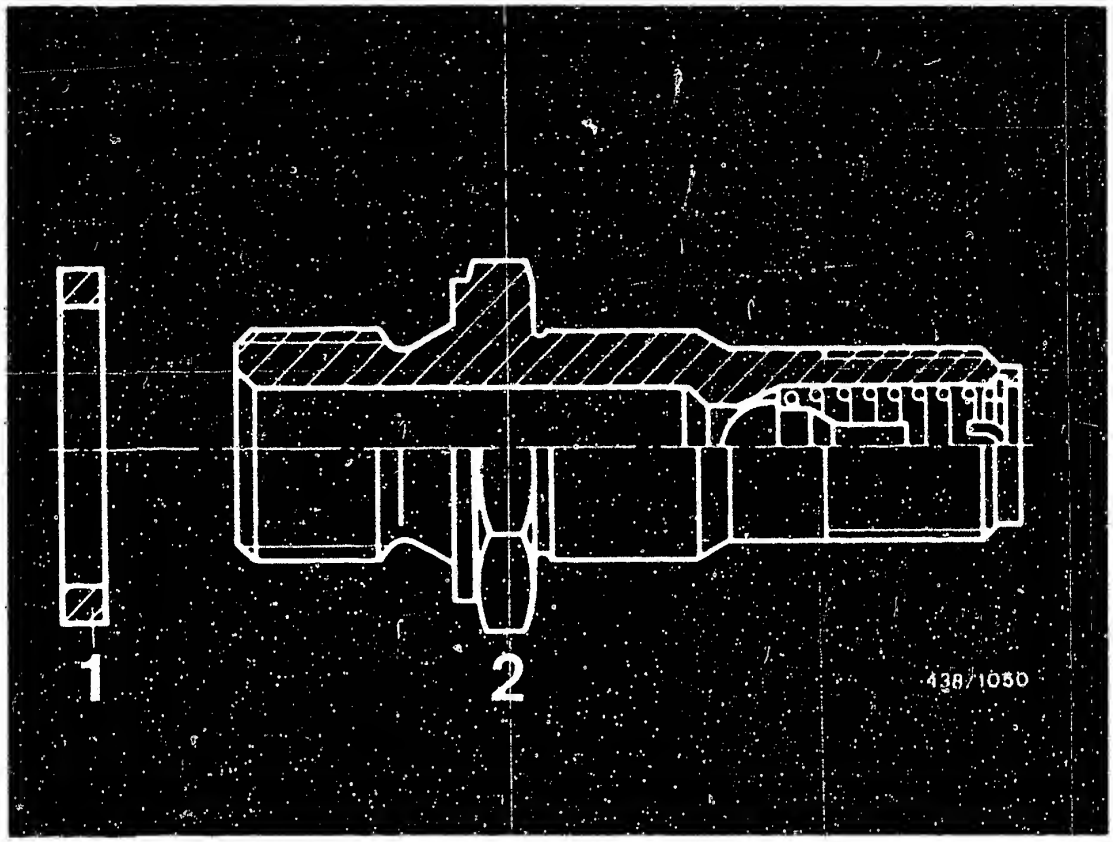


1 = Pressure damper
2 = Seal ring
3 = Flow line
4 = Retaining ring
5 = Non-return valve
6 = Hexagon nut
7 = Electric connections
8 = Electric fuel pump
9 = Electric plug

- Non-return valve in tube fitting of in-tank electric fuel pump leaking

  Part no. of electric fuel pump: 0 580 254 012

  The non-return valve is integrated in the tube fitting.



1 = Flat seal
2 = Threaded nozzle with integral check valve

Parts set: 1 587 010 500

If necessary, replace the threaded nozzle using parts set 1 587 010 500 as follows:

Remove completely assembled unit (electric fuel pump, non-return valve and pressure damper).

Unscrew pressure damper and take off flow line with flat seal rings.

Unscrew tube fitting with defective non-return valve.

Screw new tube fitting (short end) with thick flat seal ring into the delivery fitting and tighten to a torque of 17 ... 25 Nm.

Hold the hexagonal section of the delivery fitting with a wrench.

Put thin flat seal ring, inlet union of fuel line and other flat seal ring onto long end of tube fitting and tighten by means of pressure damper.

Tightening torque 17 ... 25 Nm

Re-install complete unit, paying attention to correct position of electric fuel pump.

Danger of kinking fuel lines.

• Fuel accumulators 0 438 170 019 and 020 defective.

If hot-starting difficulties are encountered on the above-mentioned vehicles, the fault may lie with the fuel accumulator. This concerns fuel accumulators 0 438 170 019 and 20 with FD 924 and 925 and works code number 050.
Accumulators with FD 924 and 925 without works code number 050 and accumulators with works code number 050 and with a yellow dot on the side of the fitting are O.K.

Accumulators which may be defective should be tested as follows:

Accumulators not installed

Test with compressed air:	Apply 4 bar pressure for approx. 5 seconds to one of the accumulator fittings. Seal off the other fitting.
If accumulator O.K.:	After removing the compressed-air connection, a whistling noise can be heard for a few seconds, followed by a clicking noise.
If accumulator defective:	After removing the compressed-air connection, only a whistling noise can be heard.

Accumulators installed

Operate the fuel pump by bridging the electrical safety circuit.

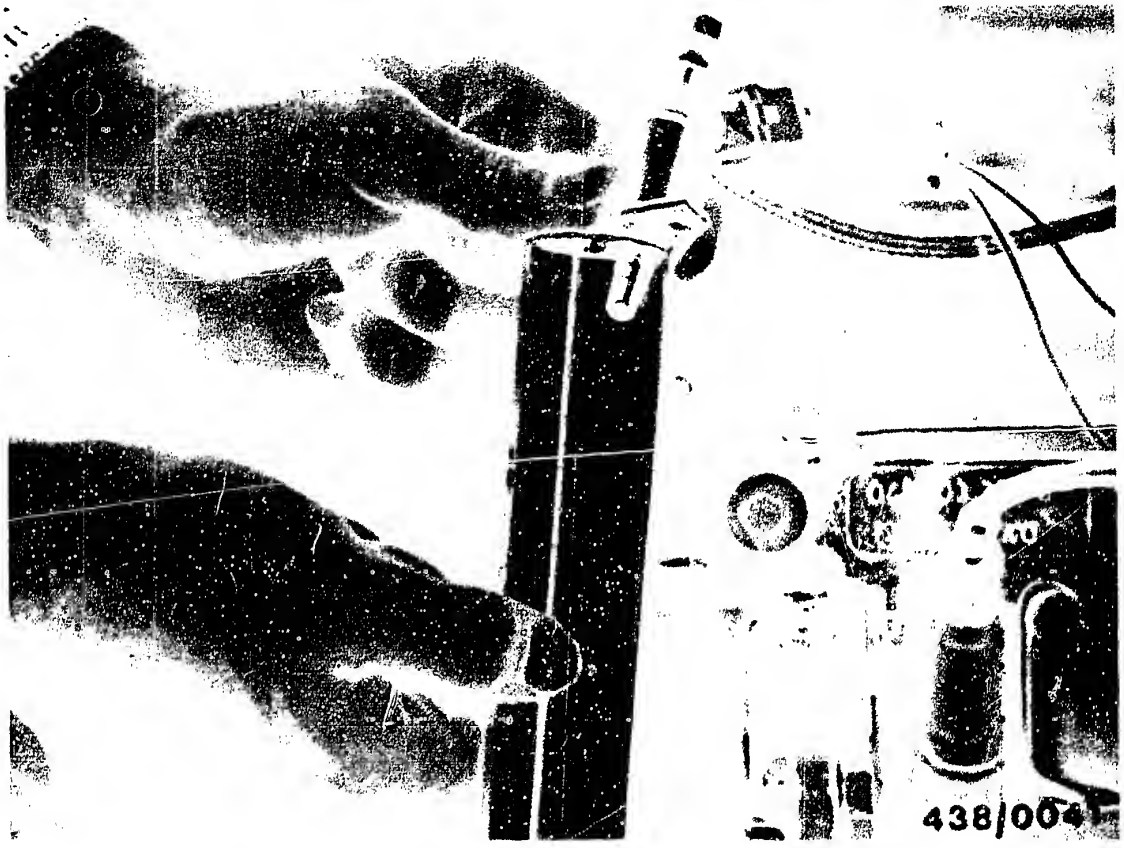
Screw out the bleeder screw on the base of the fuel accumulator.

Using a wire as a depth gauge, e.g. welding wire approx. 2 mm diameter and approx. 120 mm long, measure the penetration depth. The fuel pump must operate for approx. 1 minute before and also during the measurement. Introduce the measuring wire into the accumulator straight (if necessary, loosen mounting piece of accumulator).

Penetration depth: less than 85 mm = accumulator O.K.
greater than 92 mm = accumulator defective.

Warranty

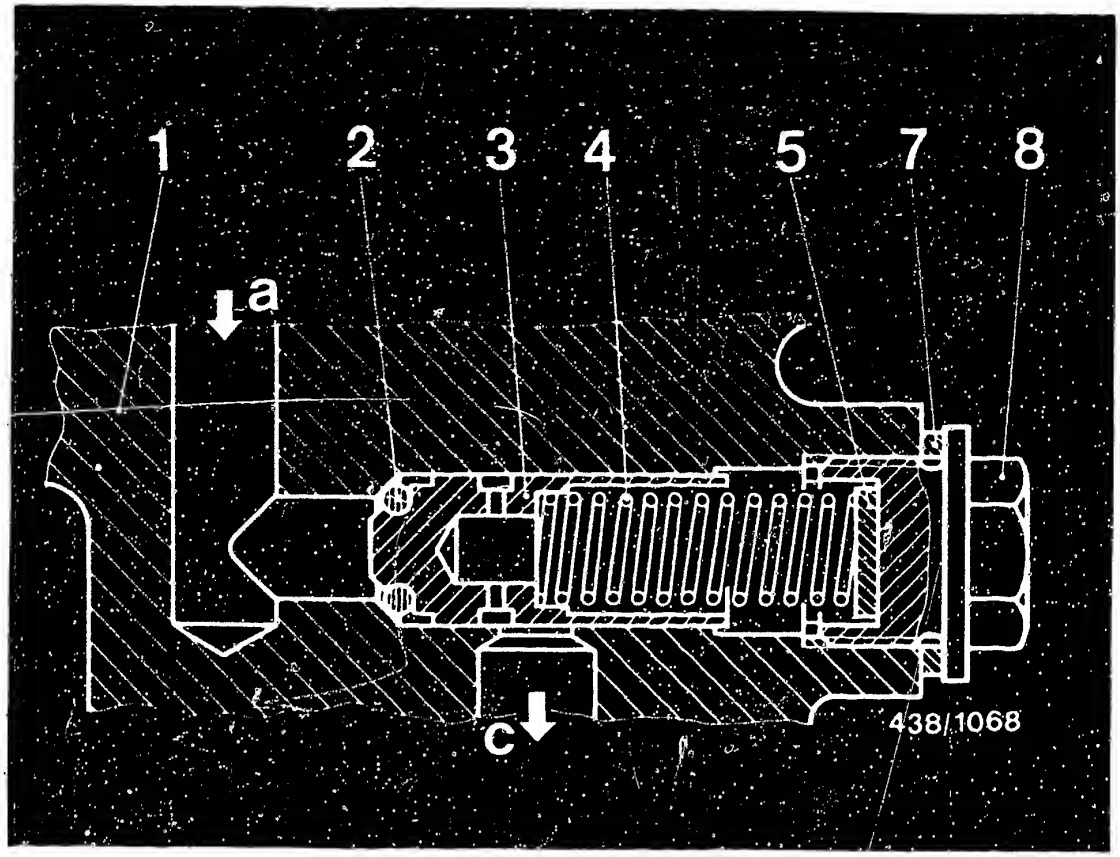
Report defective accumulators during the warranty period as usual.



• Start valve leaking

Remove start valve. Hose line remains connected.

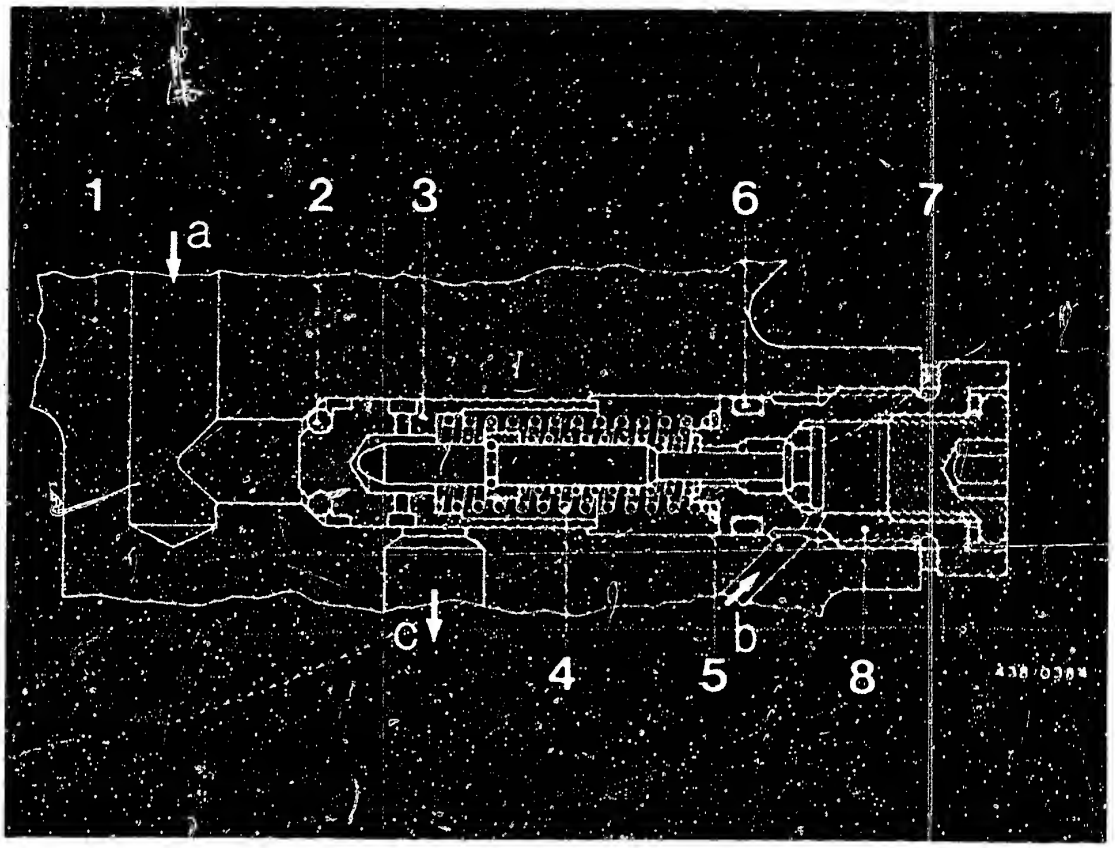
Hold start valve in container (e.g. measuring glass).
Switch on electric fuel pump by bridging the electrical safety circuit.
Dry off nozzle of start valve.
Within the next minute no drop of fuel may fall from the nozzle. Even if shaken and knocked, the start valve must not leak.
Then switch off electric fuel pump again. Replace leaking start valve. Finally, make idle adjustment with engine at normal operating temperature.
The idle adjustment is described on Coordinate G 1.



a = Primary pressure
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
7 = Flat seal ring
8 = Screw plug

- Seal ring (O-Ring) on control piston of primary-pressure regulator leaking:

  Picture shows fuel distributor 0 438 100 005 (without push valve).



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

Picture shows fuel distributor with push valve

Replacing the seal ring:
Clean the fuel distributor in the region of the primary-pressure regulator.

Screw out the large screw plug (8) with the complete push valve. Also remove shims (5), control spring (4) and control piston (3).

Replace seal ring (O-ring) (2) on control piston, fit control piston and control spring.

Screw in screw plug with complete push valve and with shims (as when removed) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

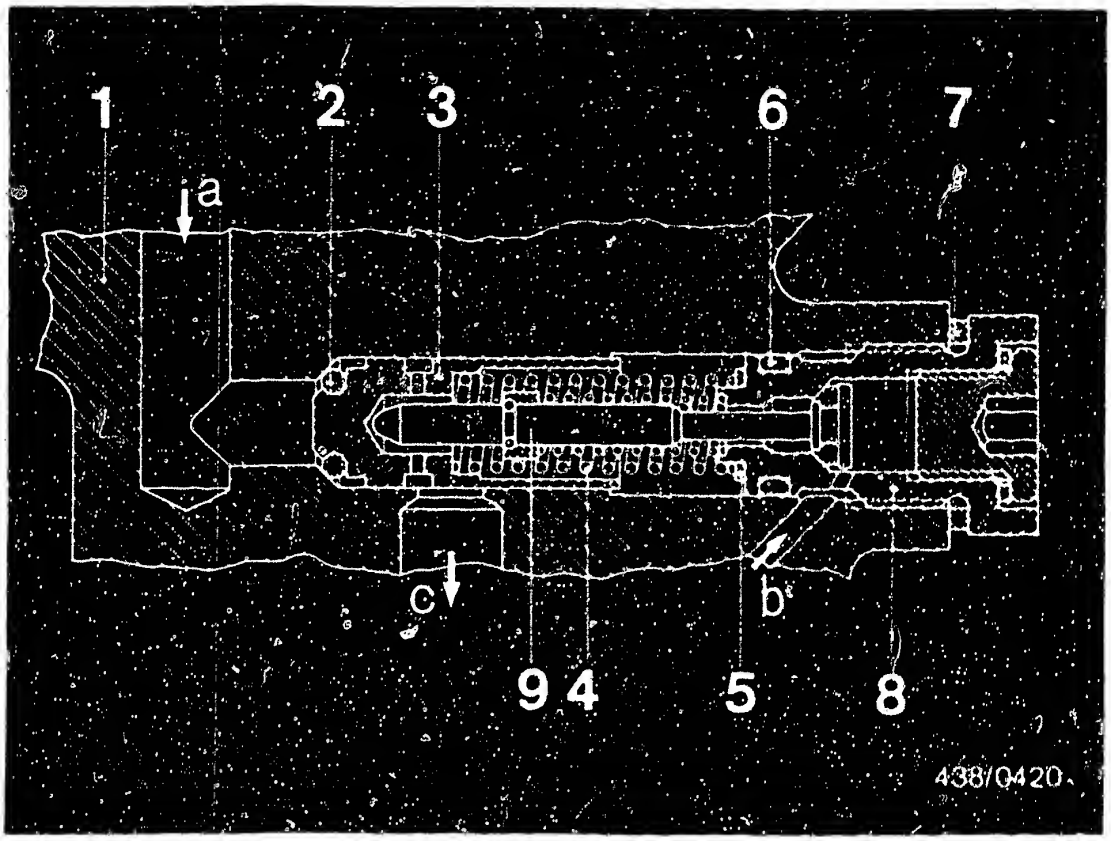
Primary pressure - test specifications and setting values (gauge pressure)

Fuel distributor No.: 0 438 100 005

Checking value:	4.5...5.2 bar	(4.6...5.3 kgf/cm²)
Setting value :	4.7...4.9 bar	(4.8...5.0 kgf/cm²)

Fuel distributor No.: 0 438 100 059/079
0 438 100 100

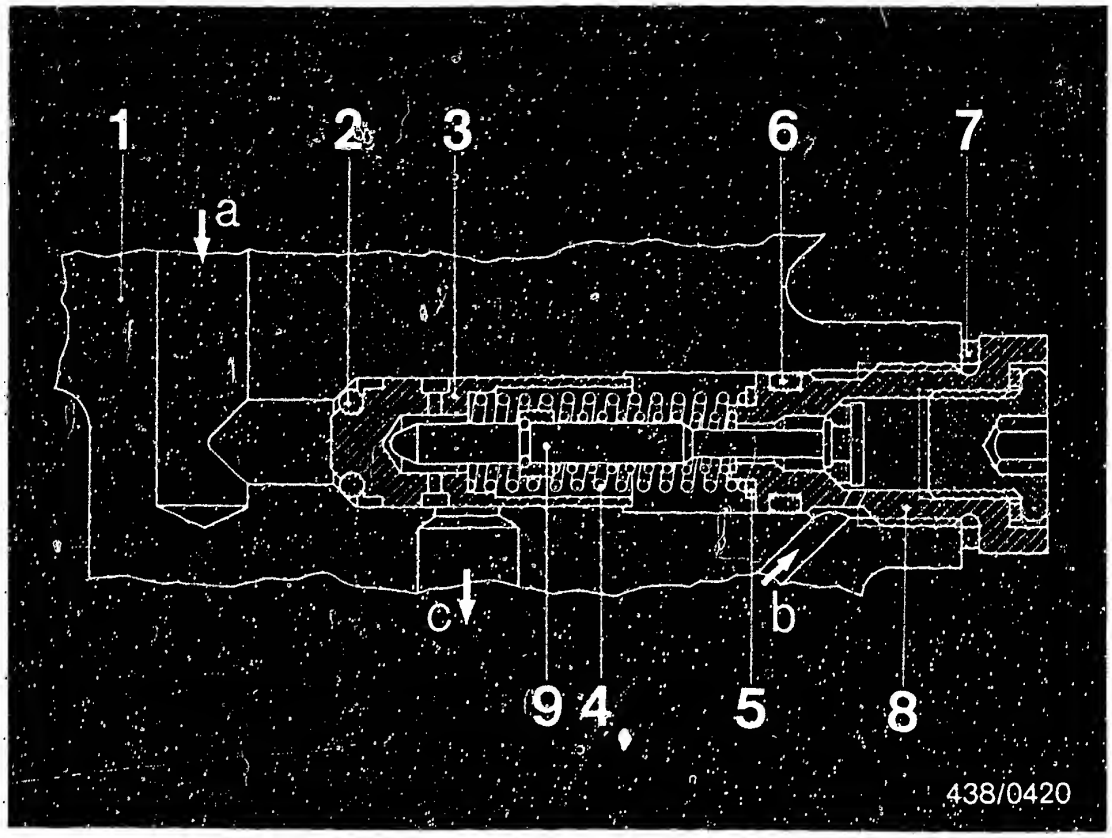
Checking value:	4.7...5.4 bar	(4.8...5.5 kgf/cm²)
Setting value :	4.9...5.1 bar	(5.0...5.2 kgf/cm²)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

17.5 Possible cause of trouble in control-pressure circuit

- Vehicles with fuel distributor 0 438 100 005 have no push valve for sealing the warm-up regulator return. In case of a leak in the control pressure circuit the warm-up regulator is the cause.
  Replace the warm-up regulator



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

- In vehicles with a push valve integrated in the primary-pressure regulator of the fuel distributor, this push valve seals the warm-up regulator return. If there is a leak in the control-pressure circuit, the push valve (9) is the cause, i.e. replace it.

Since the seal ring of the push-up valve is rigidly vulcanized onto the valve needle, it is necessary in the event of a defect to replace the complete push-up valve (ready-assembled unit, Item 9).

This also applies when replacing earlier versions of the push-up valve with a loose O-ring on the valve needle. The O-ring is no longer available as a separate part. If necessary, therefore, always install the complete valve unit.

Clean the fuel distributor in the region of the primary-pressure regulator. Unscrew the large screw plug (8) with the complete push-up valve. Pay attention to the control spring (4) and the shims (5).

Screw in the new push-up valve with the previously found number of shims (5), a new O-ring (6) and flat seal ring (7).

Then check the primary pressure again and, if necessary, adjust by changing the shims (5).

Primary pressure - test specifications and setting values (gauge pressure)

Fuel distributor No.: 0 438 100 005

Checking value : 4.5...5.2 bar (4.6...5.3 kgf/cm²)
Setting value : 4.7...4.9 bar (4.8...5.0 kgf/cm²)

Fuel distributor No.: 0 438 100 059/079
0 438 100 100

Checking value : 4.7...5.4 bar (4.8...5.5 kgf/cm²)
Setting value : 4.9...5.1 bar (5.0...5.2 kgf/cm²)

18. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
When refitting the injection valves, it is best to replace the O-rings on the valve stem (Part No. 3 430 210 600) in order to prevent leaks and thus the entry of unmetered air. Also check the insulation sleeves for leaks. If necessary, tighten using Allen wrench.

- Note fixed air-guide cap on injection valves 0 437 502 023/ ... 024 and 0 437 502 026/ ... 027 If damaged, replace complete injection valve.

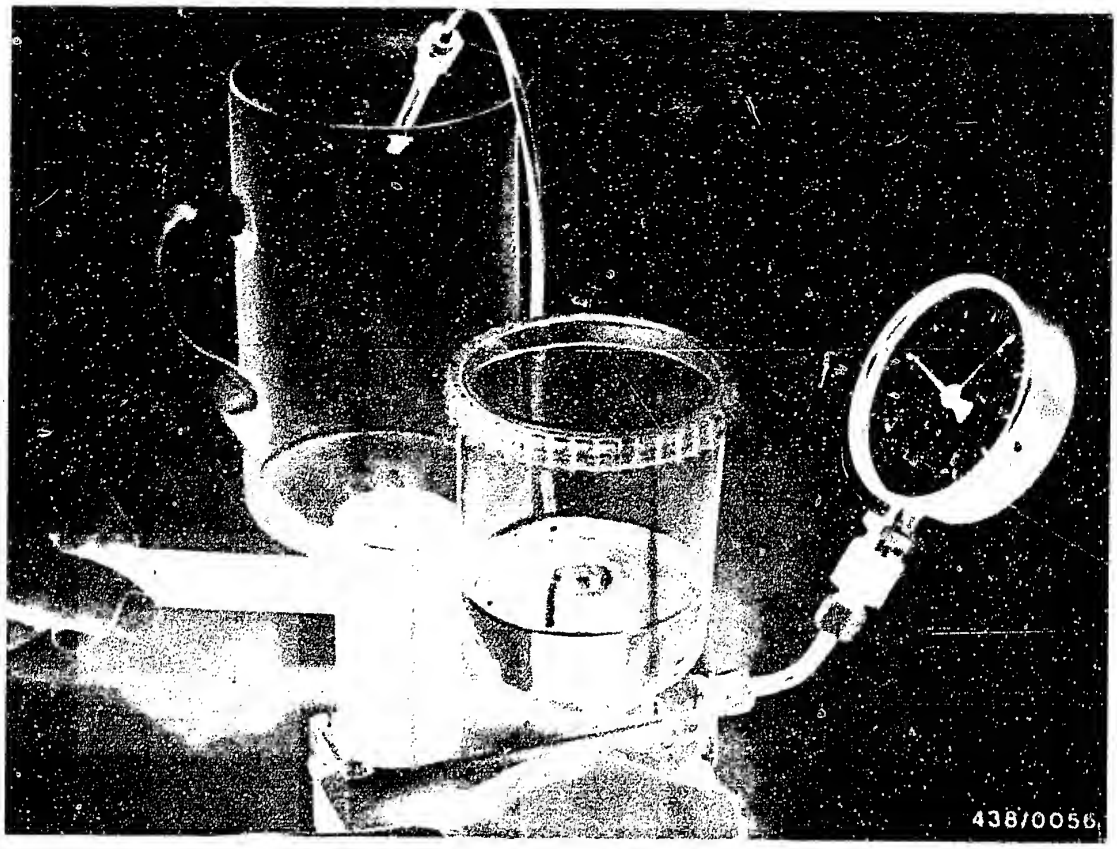
18.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co.
D-7531 Kämpfelbach-Bilfingen

Caution: For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

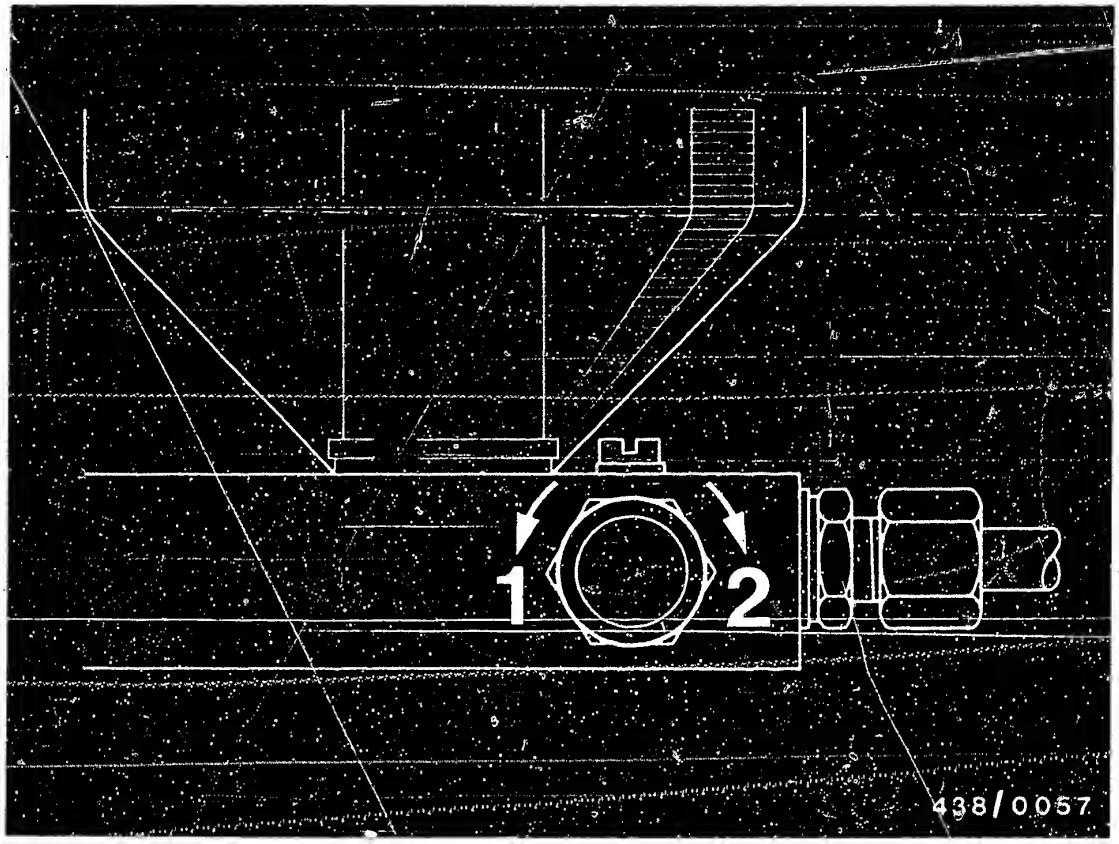


18.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

18.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly. If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.

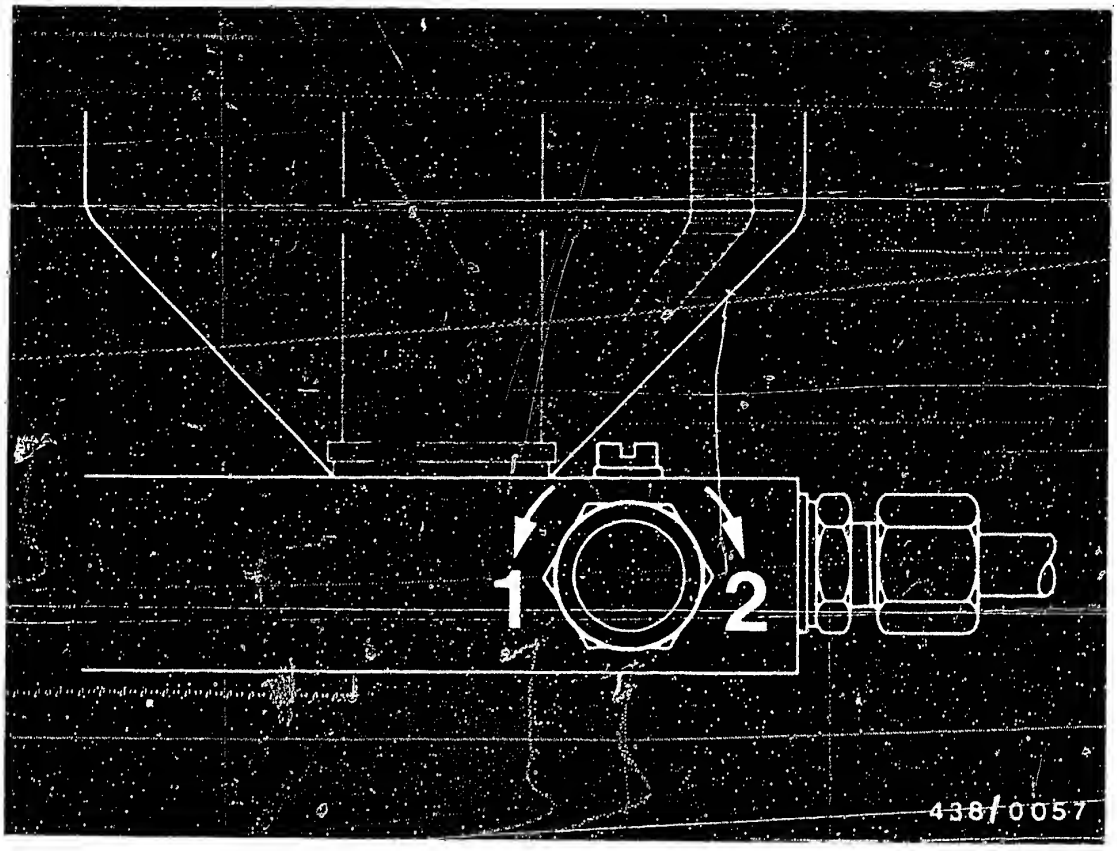


1 = Open 2 = Closed

18.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 007:	2.5...3.6 bar (2.6...3.7 kgf/cm²)
0 437 502 015 until FD 828:	2.7...3.8 bar (2.8...3.9 kgf/cm²)
0 437 502 016 as of FD 829:	3.0...4.1 bar (3.1...4.2 kgf/cm²)
0 437 502 023/... 024 0 437 502 026/... 027	3.0...4.1 bar (3.1...4.2 kgf/cm²)

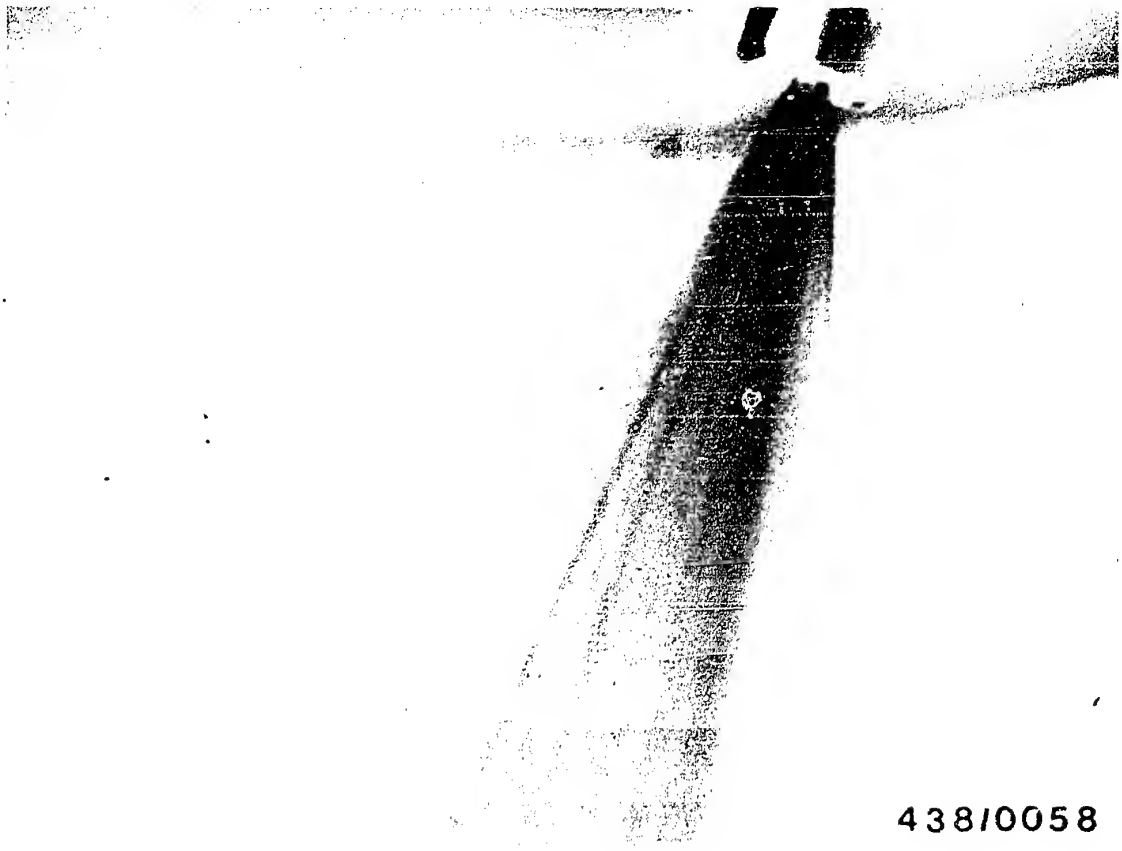
With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).
If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be replaced within a set.



1 = Open 2 = Close

18.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 25 seconds.



438/0058

18.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

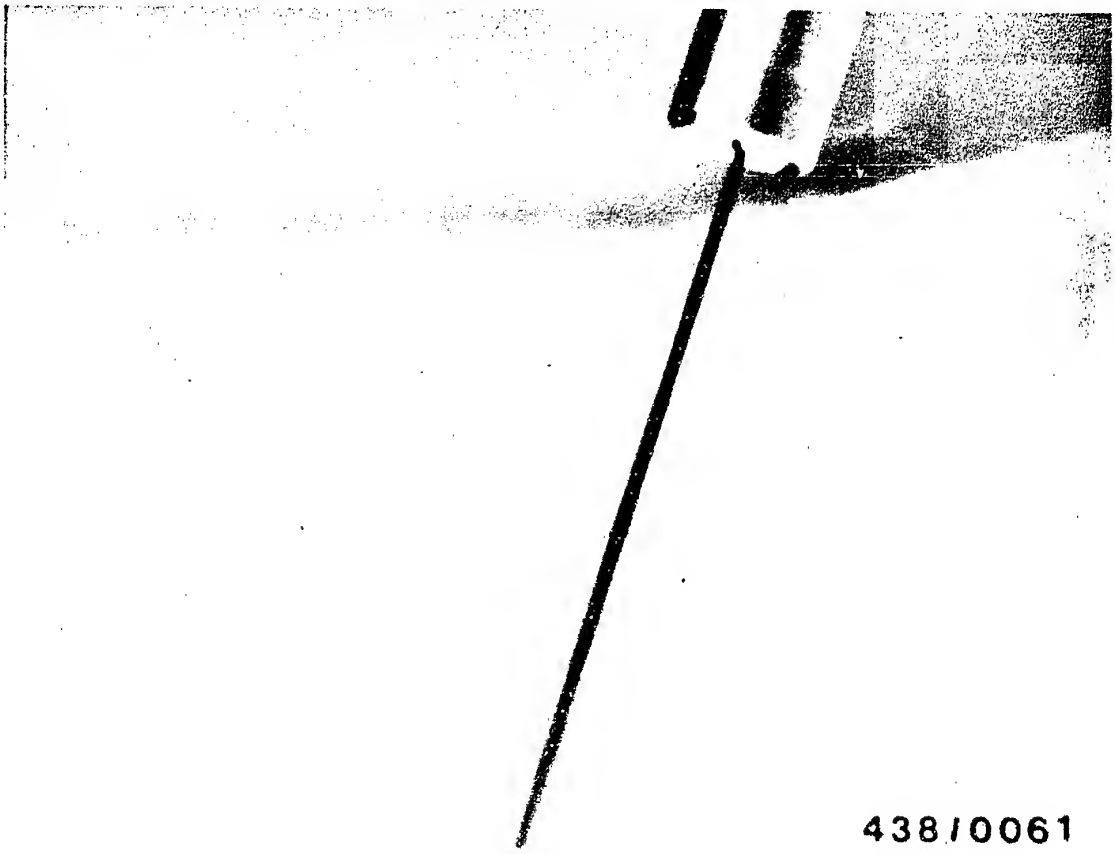
438/0059

Illustration shows single-sided but nevertheless good spray formation.

438/0060

Poor spray formation; replace injection valves.

Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

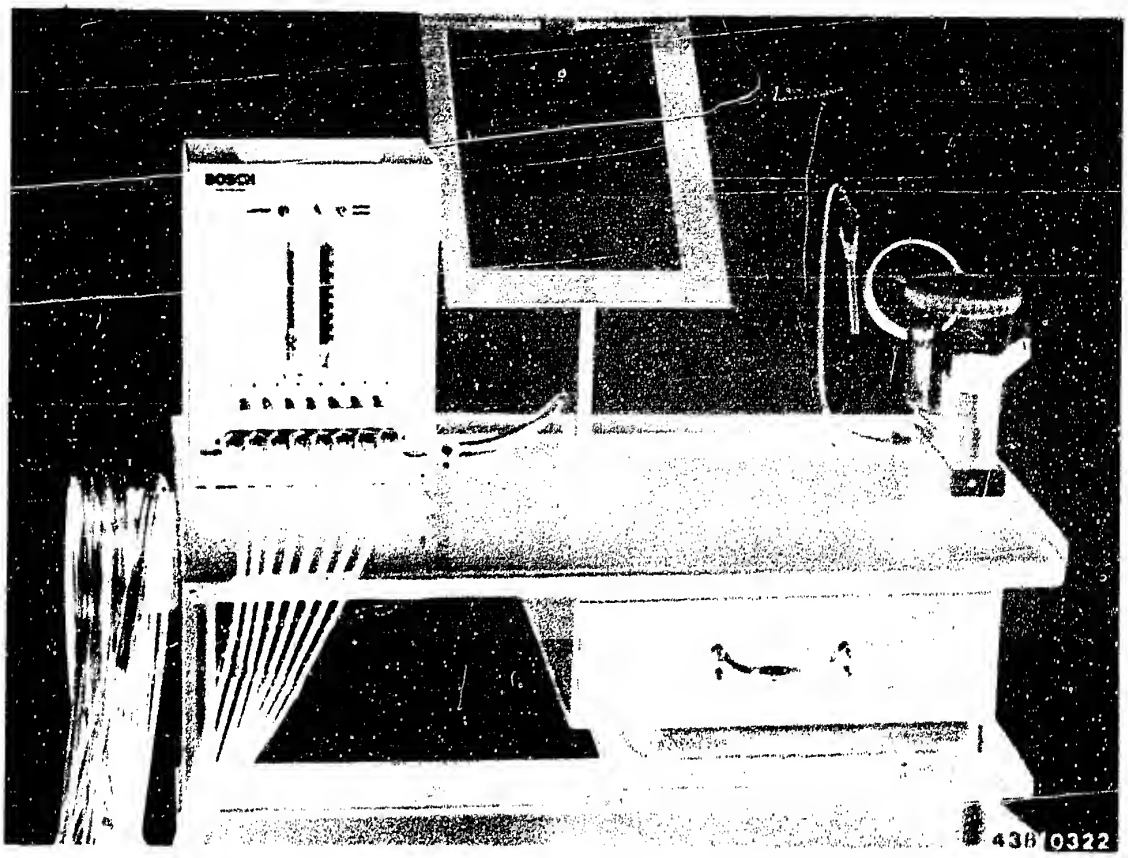
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 1.

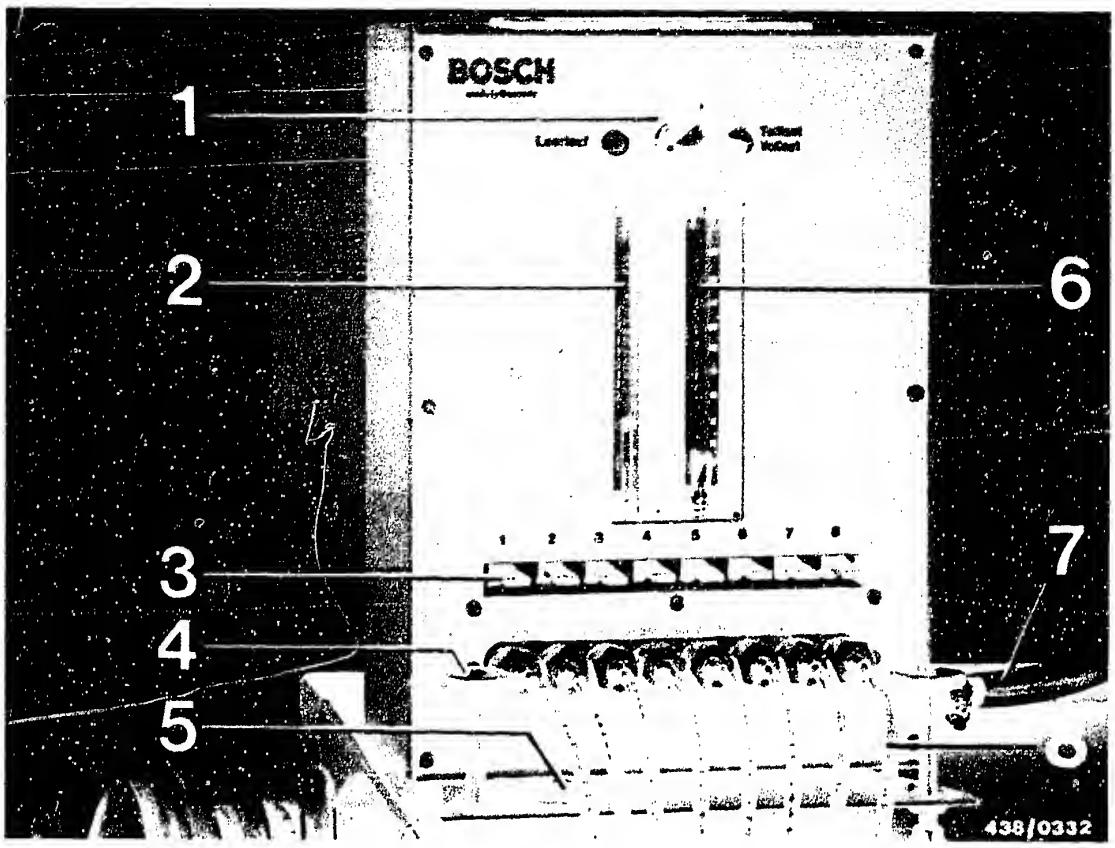


19. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

19.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

19.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

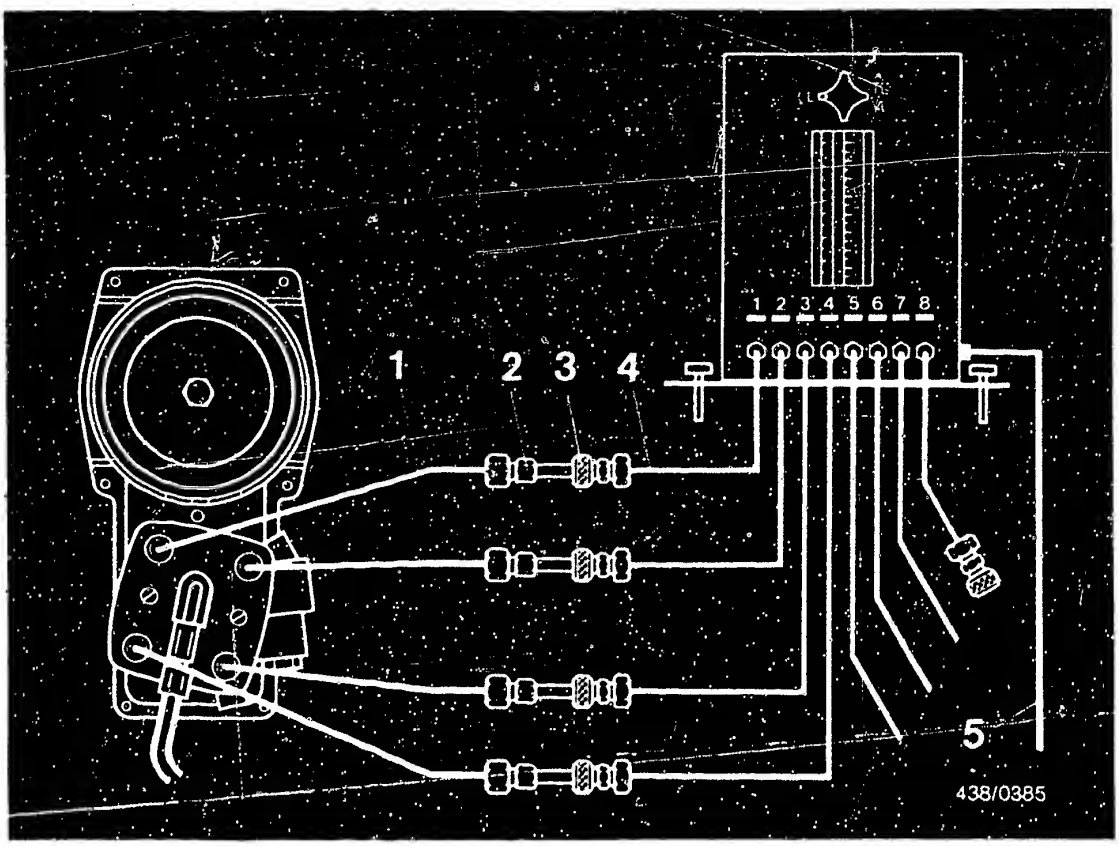
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Fuel distributor injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

19.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

Remove injection valves; the injection tubing remains connected.

Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

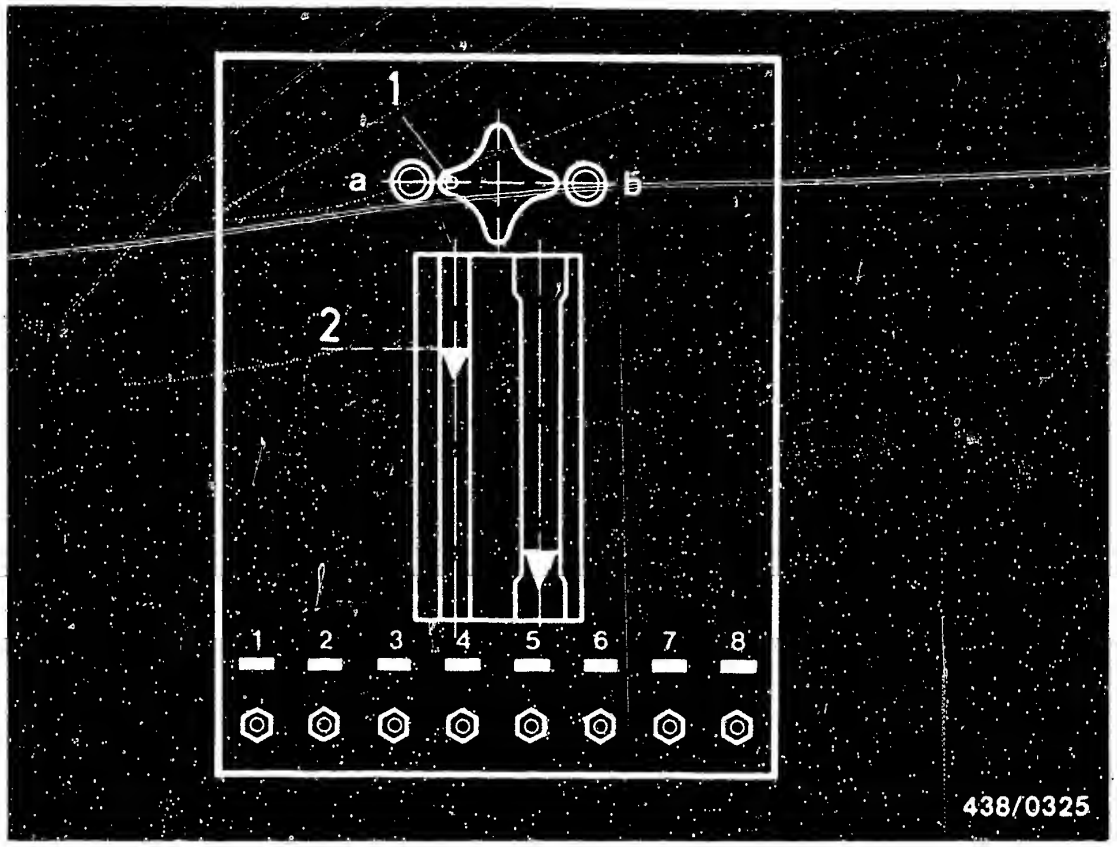
Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.

For injection valves with fixed air-guide cap
0 437 502 023/ ... 024 and 0 437 502 026/ ... 027
use adapters KDJE-P 200/19.

Introduce the return hose of the tester into the fuel tank filler neck.

19.4 Bleeding the tester:

Remove the rubber hood (loosen 2 clamping bands) so that air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.



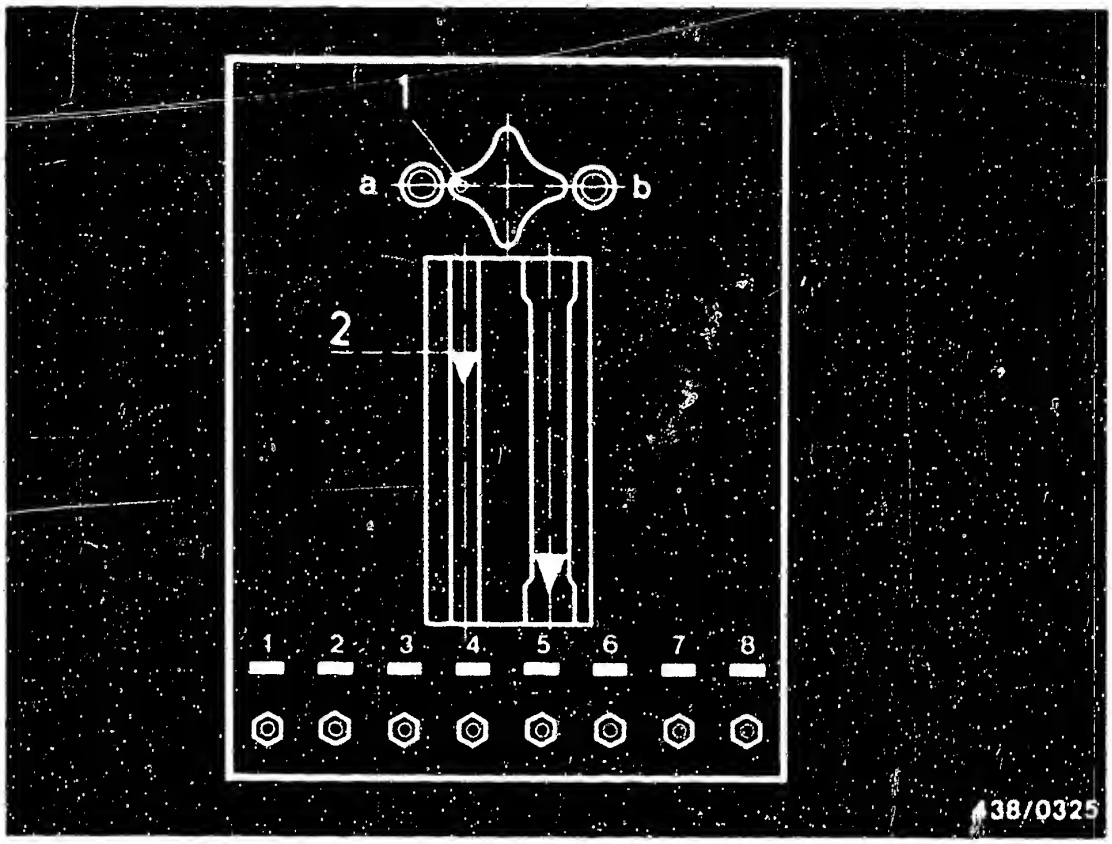
1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

19.5 Testing:

The flow comparison measurement is made in the idle, part-load and full-load ranges.

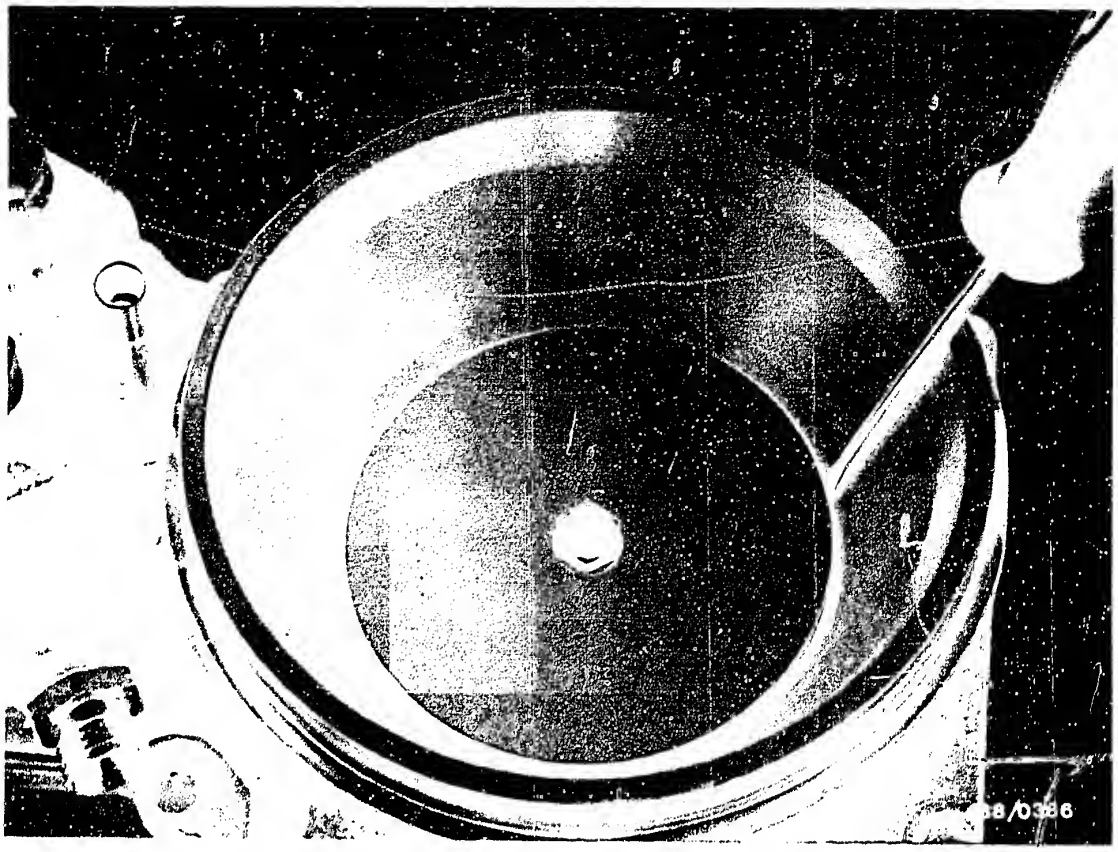
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.

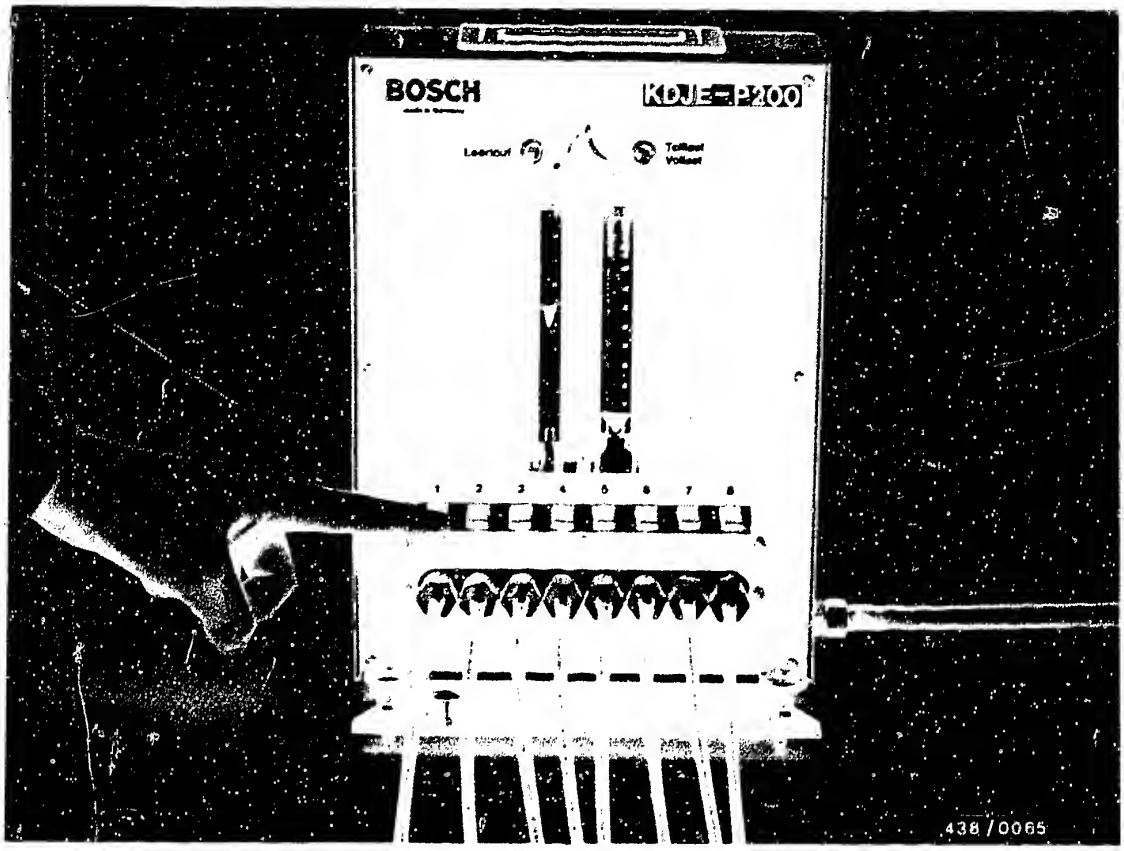


The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the kex for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

19.6 Test specifications

Fuel distributor Part No. 0 438 100 005 0 438 100 059	Setting point	max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 160.0 cm^3/min.*	6.0 cm^3/min. 44.0 cm^3/min. 175.0 cm^3/min.
Fuel distributor Part No. 0 438 100 079	Setting point	max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 160.0 cm^3/min.	6.7 cm^3/min. 43.0 cm^3/min. 175.0 cm^3/min.
Fuel distributor Part No. 0 438 100 100	Setting point	max. allowable delivery
Idle Part load Full load	6.0 cm^3/min. 40.0 cm^3/min. 110.0 cm^3/min.	6.6 cm^3/min 43.0 cm^3/min. 120.0 cm^3/min.

* This full-load delivery must be obtained at least with maximum deflection of the air-flow sensor plate. If not, replace the fuel distributor.

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

19.7 Final Operations

Check the seal rings on the stem of the injection valves for damage and deformation. If necessary, use new seal rings Part No. 3 430 210 600.

Also check the insulating sleeves. If necessary, tighten using Allen wrench.

Re-fit the injection valves properly. Also fit the rubber hood. Make sure that all lines are laid correctly.
Re-connect the electrical safety circuit of the K-Jetronic properly (re-insert relay). By means of a trial run check that there are no leaks at any line connections.

Finally check the idle adjustment and, if necessary, correct.
Idle adjustment is described on Coordinate G 1.

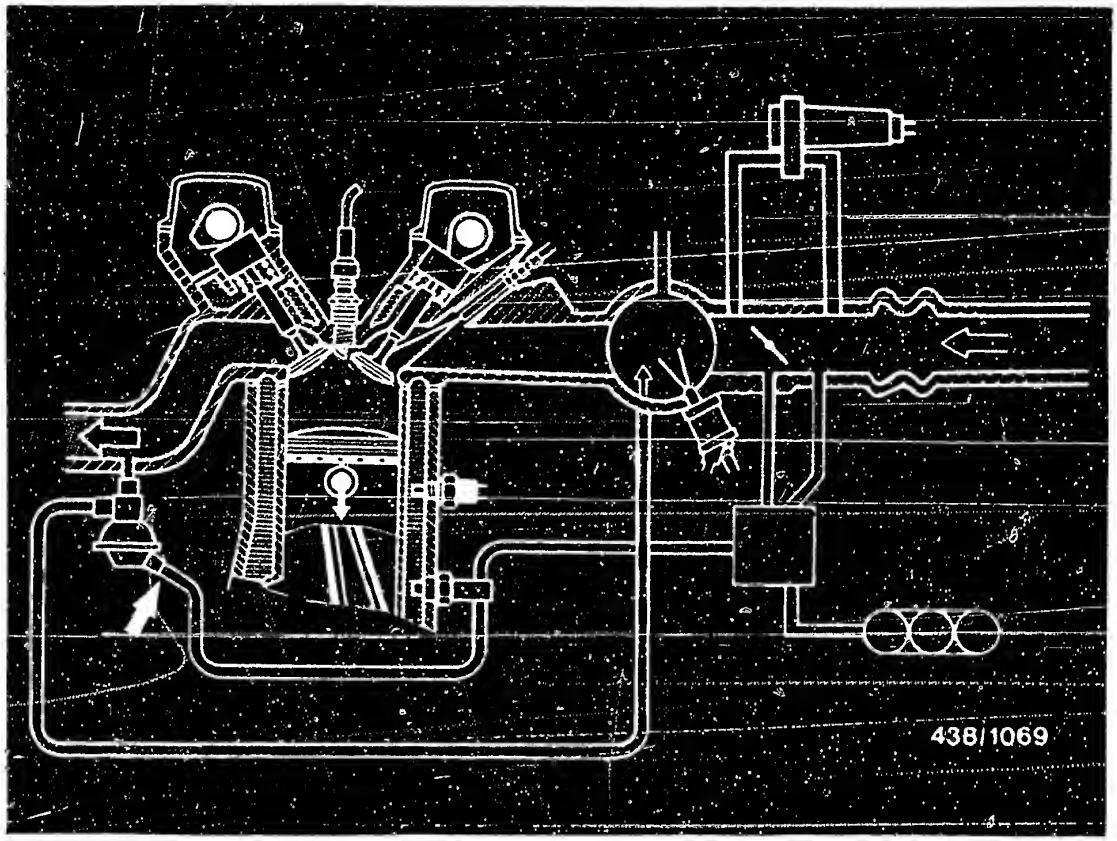
20. Idle adjustment

20.1 Test conditions:

Warm the engine up for the idle adjustment (oil temperature approx. 80° C).

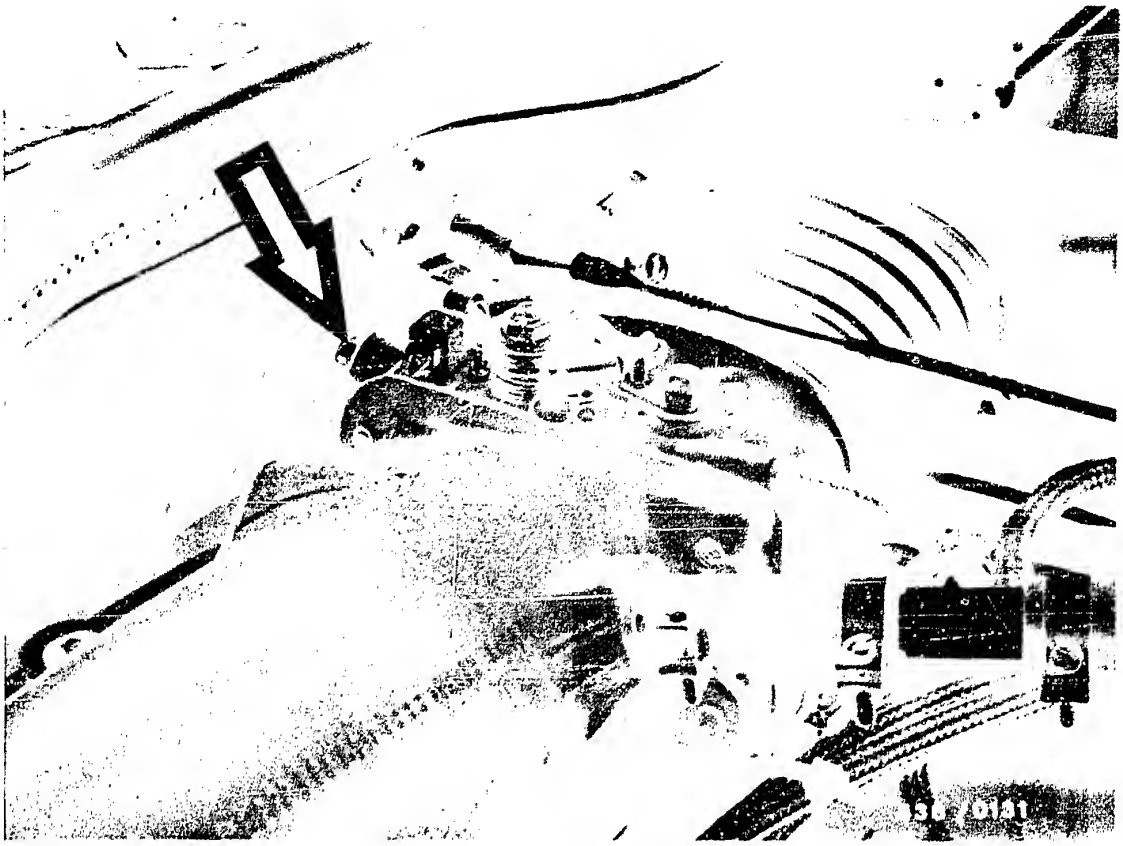
Important note:

- If fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- Switch on the upper beam (lowering the idle speed).
- Remove crankcase breather hose from cylinder head cover and seal off end of hose.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed for the idle adjustment.
- Before adjusting, check whether the throttle-plate lever is up against the idle stop. The cable should be free of tension.
- Engine-speed measurement with separate tachometer.
- As of 1985 model:
  Pinch off hose to idle valve with hose clamper.



20.2 Rendering the exhaust-recirculation system inoperative

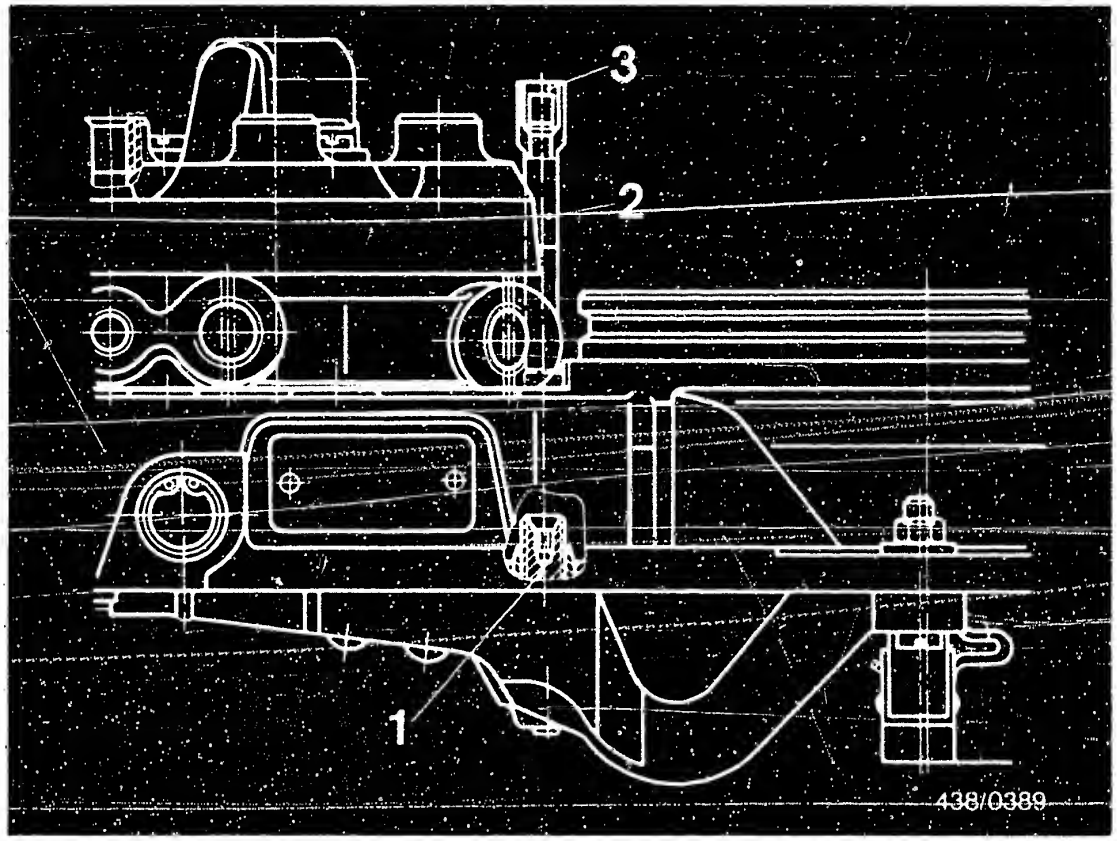
Concerns only vehicles of the Sweden and Switzerland version.
Remove manifold-pressure hose line (arrow) from EGR valve.
Seal off tight the end of the hose and the fitting of the EGR valve.



20.3 Adjusting the idle speed and the CO concentration

Adjust the idle speed at the bypass screw (arrow) on the throttle-valve assembly.

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw in the mixture-control unit.



The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap (3) the adjusting wrench is passed through the guide tube (2) and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

20.4 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influenceing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under part number 3 430 522 002.

The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device for the air-flow sensor is removed and fitted using special tools (e.g. No. 4521/7 from the firm Hazet, 5630 Remscheid).

20.5 Test specifications and settings for idle adjustment:

- Conditions:

  Engine at normal operating temperaure, oil temperature approx. +80° C.

  Switch on upper beam. Switch off air conditioner. Render exhaust-gas recirculation system (if fitted) inoperative.

  Remove crankcase breather hose from cylinder head cover and seal off end of hose.

  Radiator fan must not be operating when performing the adjustment.

- Idle speed

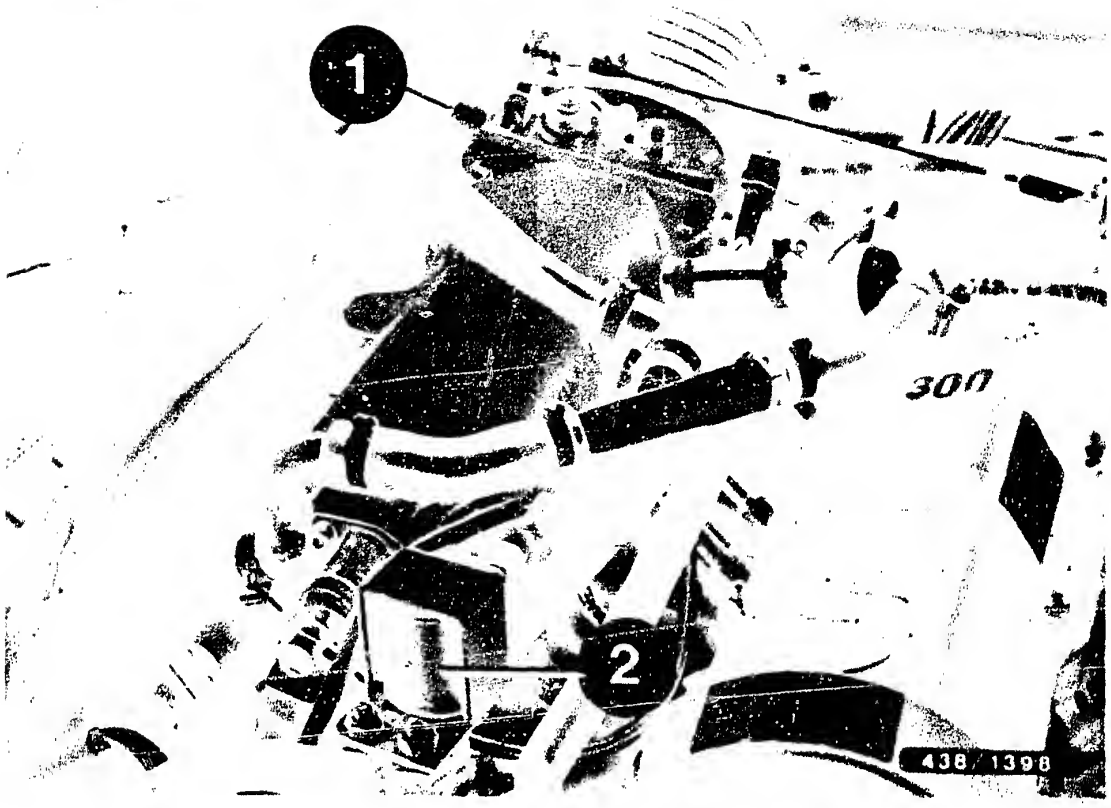
  All versions: 800...1000 min^{-1}

- CO concentration: 1.0...2.0 % by vol. CO

20.6 Final operations

Reconnect the crankcase breather hose on the cylinder head cover.

Reconnect the manifold-pressure hose line of the exhaust-gas recirculation system (if fitted) to the recirculation valve.

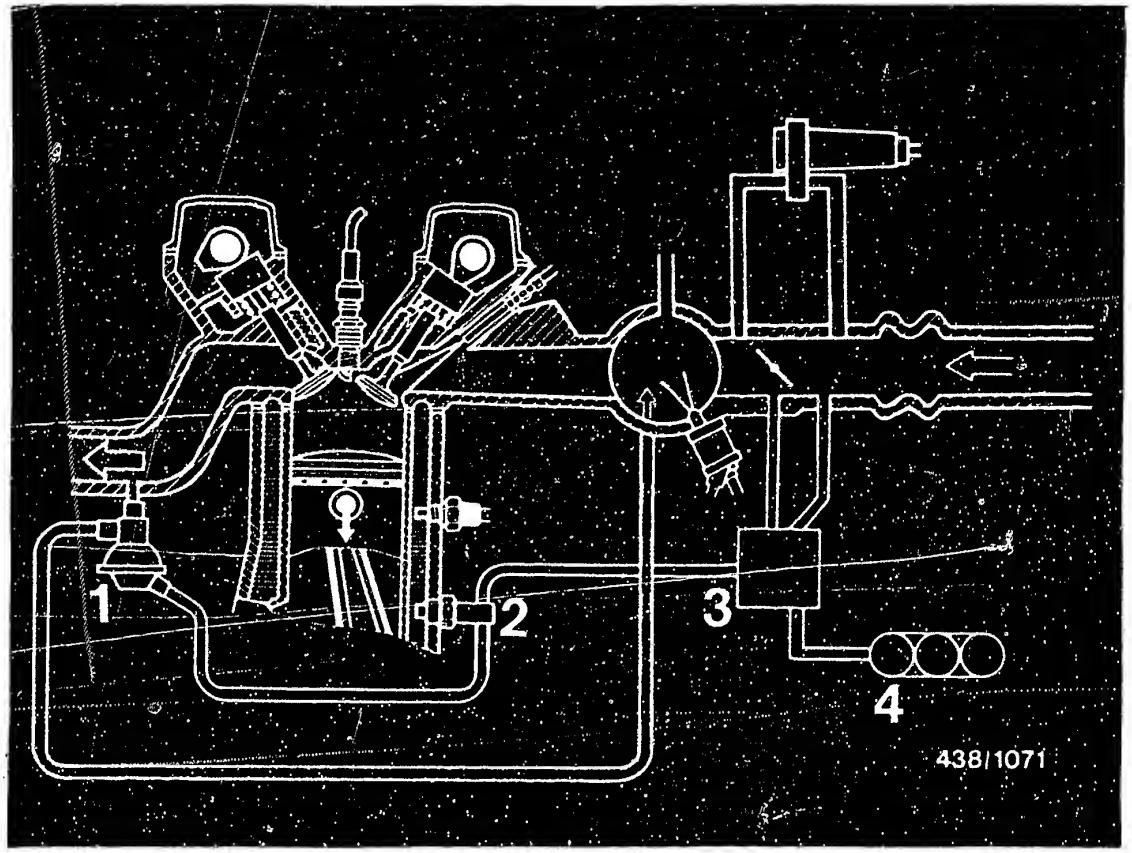


1 = Idle-speed bypass screw
2 = Idle valve

20.7 Idle valve for engine-speed increase (as of 1985 model)

- Checking the idle valve
  Screw in idle-speed bypass screw until engine speed drops below 700 min^{-1}.
  The valve must open and raise the engine speed. Above 1050 min^{-1} the valve closes.

- Checking the idle-control unit
  Ground connected to term. 87 to valve term. 31 = ground
  Term. 15 = Vehicle electrical system voltage
  Term. 1 = Ignition pulses from ignition coil



1 = EGR valve
2 = Thermopneumatic valve
3 = Vacuum booster
4 = Vacuum accumulator

21. Exhaust-gas recirculation (not made by Bosch)

Vehicles for Sweden and Switzerland are equipped with exhaust-gas recirculation.

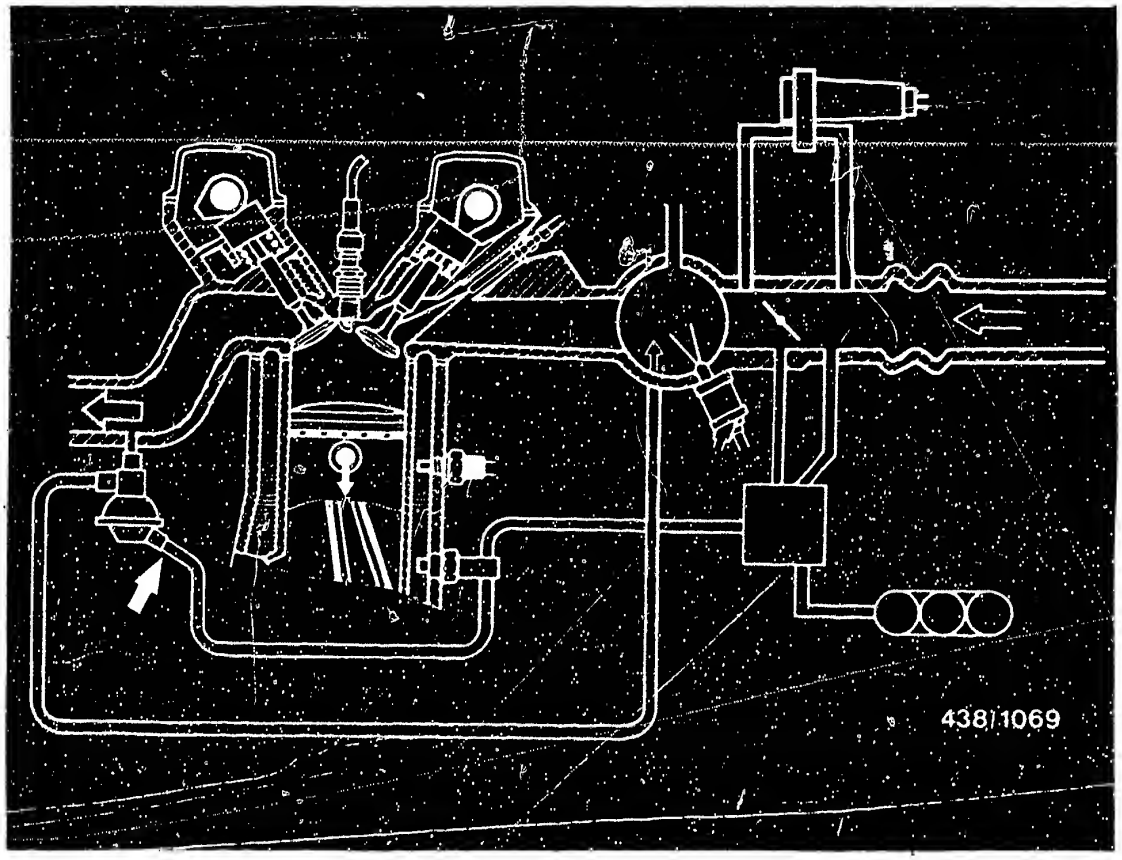
21.1 Operation

By way of a vacuum-controlled recirculation valve some of the exhaust gas is recirculated to the intake manifold when the engine is warm and operating in the part-load range. The presence of the exhaust gas in the combustion chamber lowers the combustion temperature, and the emission of nitrogen oxides (NO_x) is reduced.

The thermopneumatic valve and the position of the manifold connection port on the throttle-valve assembly ensures that exhaust gas is only recirculated when the engine is warm and operating in the part-load range. There is a reduction in engine speed.

The exhaust-gas recirculation system is inoperative when the engine is idling, at full load and also when the engine is cold.

If the vehicle is operated in countries whose exhaust-emission legislation does not require such systems, it is not necessary to shut down the exhaust-gas recirculation system.



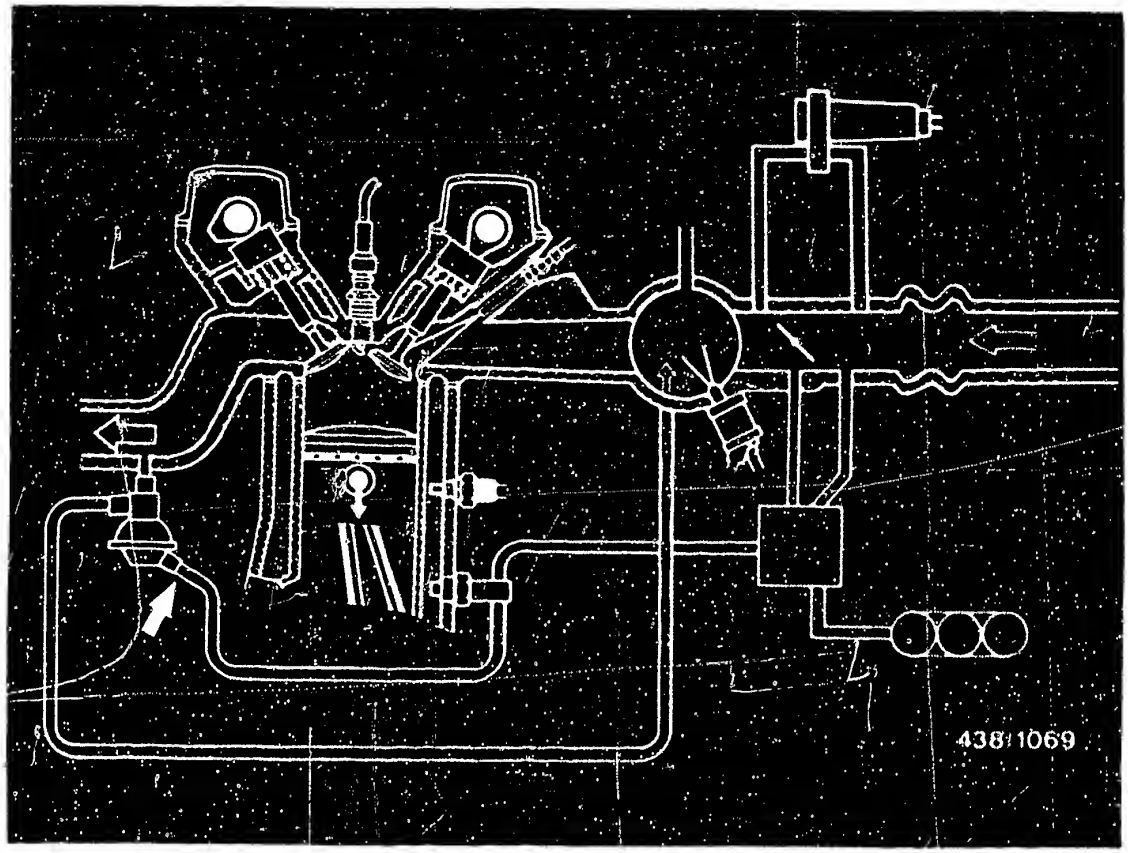
21.2 Tests with the engine running

- EGR valve

  Remove the vacuum control line (arrow) from the EGR valve. Connect Mityvac hand vacuum pump and apply vacuum to EGR valve. There must be a clear deterioration in engine running. If not, replace EGR valve.

- Vacuum control

  Remove the vacuum control line from the EGR valve and connect Mityvac hand vacuum pump to control line. At part load there must be vacuum. At idle there must be no vacuum. Otherwise test the vacuum connections on the throttle-valve assembly.



- Thermopneumatic valve

  Remove vacuum-control line (arrow) from EGR valve and connect Mityvac hand vacuum pump to control line.

  At engine temperatures below + 45°C the thermo-pneumatic valve must be closed; at above 61°C it must be open.

  Replace thermopneumatic valve if defective.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich K-H. Kundendienst, Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254

VDT-I-438/104 En
3.1984
(Replaces Ed. 3.1983)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
003	502	---	---
005	502	---	---
007	500	---	---
008	508	---	---
010	508	---	---
011	002	---	---
941	002	---	---
942	002	---	---
945	006	---	---
947	002	---	---
948	005	---	---
949	002	---	---
950	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
963	005	---	---
964	002	---	---
965	002	---	---
967	002	---	---
968	002	---	---
970	002	---	---
972	002	---	---

Electric fuel pump	Parts set (non-ret. valve and seal ring)	Non-return valve	Seal
0 580 254 973	1 587 010 002		
975	003[4]		
976	004[3]		
978	1 587 410 901		
979	010 004[3]		
980	002		
982[1]	003[4]		
982[2]	1 587 410 901		
984	010 004[3]		
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996		386 001	001
998		385 004	002
9 580 233 014	508	---	---
234 003	002	---	---
005	002	---	---

[1] = up to FD 822 [2] = as from FD 823

[3] = parts set ..003 can also be used (delivery-line connection at 90°)

[4] = parts set ..004 can also be used (delivery-line connection axial)

Please direct questions and comments concerning the contents to our authorized representative in your country.

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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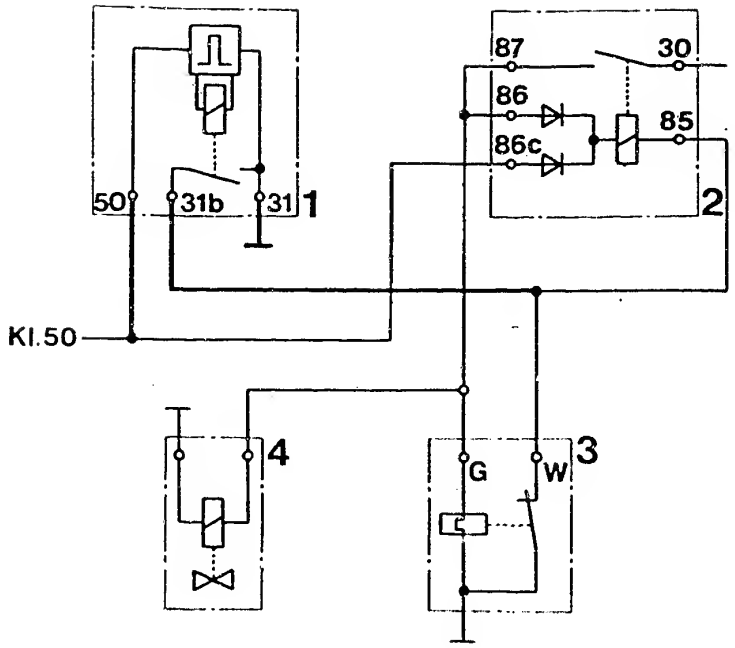
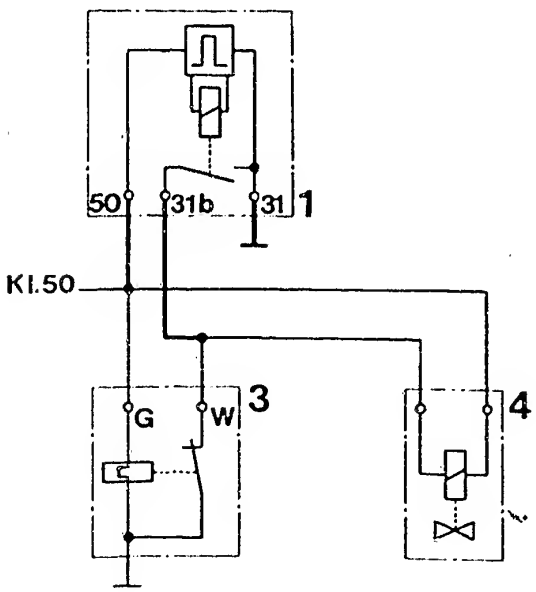


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

O-RING FOR K-JETRONIC INJECTION VALVES
0 437 502

VDT-I-438/108 En
7.1982

For K-Jetronic injection valves with O-ring seals the O-ring is available as a service part under Part No.: 3 430 210 600.

This O-ring is also listed on service-part microfiche EE...* together with other Jetronic service parts.

* See microfiche EE00 under 0 280 ..

Since the O-rings are exposed to extreme temperatures, they should be replaced whenever service work is performed.
"Unmetered air" which is drawn in through leaky injection valve seals is a frequent cause of trouble.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	•	•	•	(•)	(•)
Secondary-air induction*	•	•	•	(•)	(•)
Secondary-air injection*	•	•	•	(•)	(•)
Catalytic converter*	-	-	-	•	•
Lambda closed-loop control	-	-	-	•	•

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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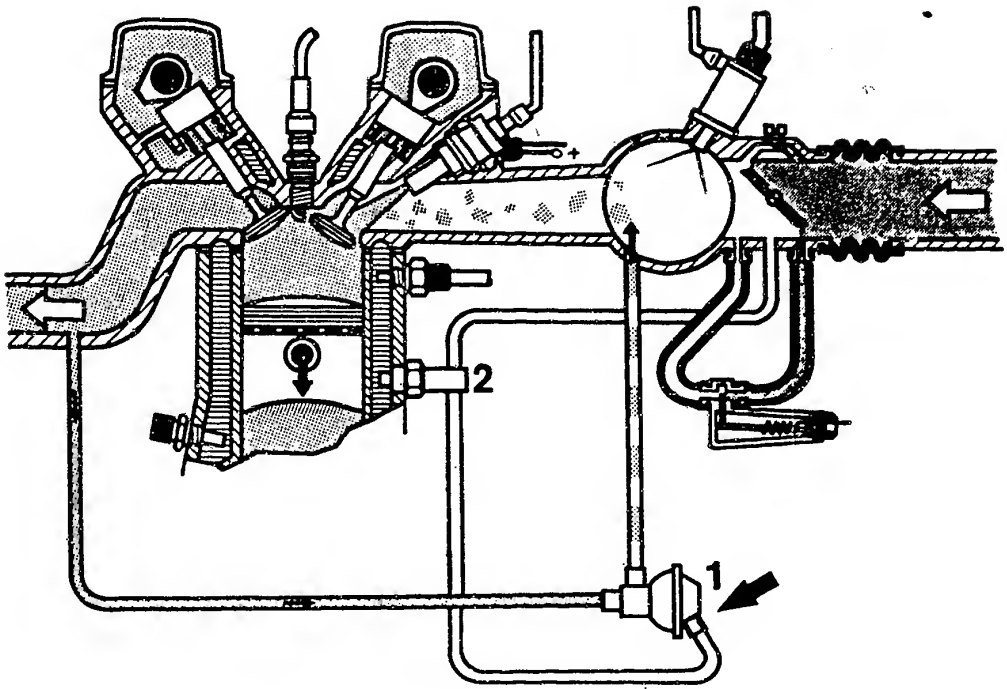
1. Exhaust-gas recirculation (EGR)



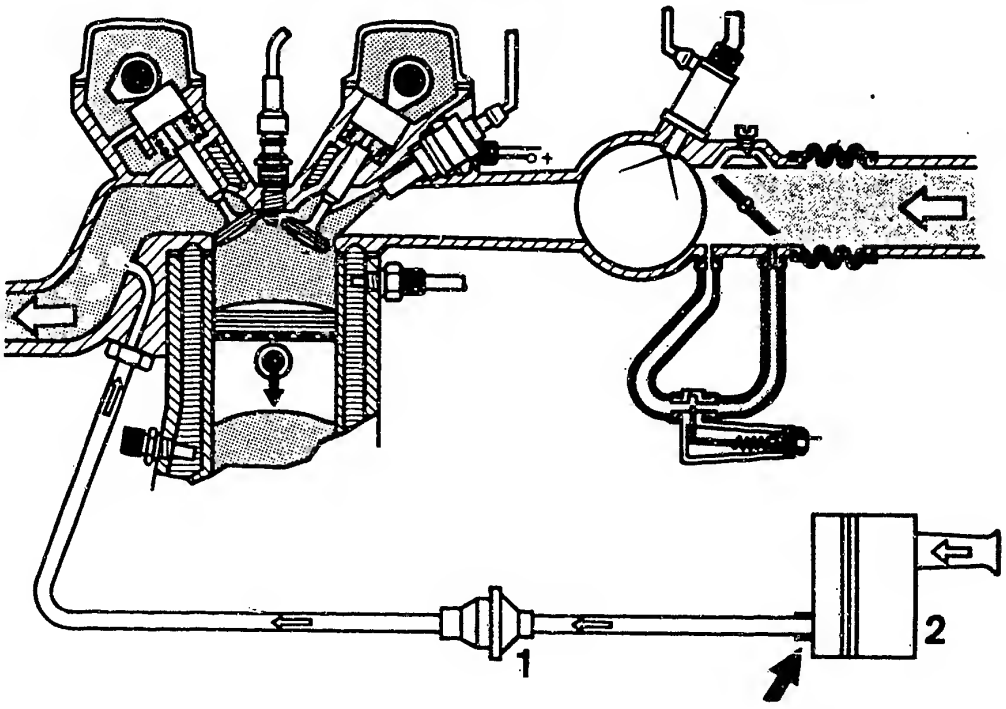
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



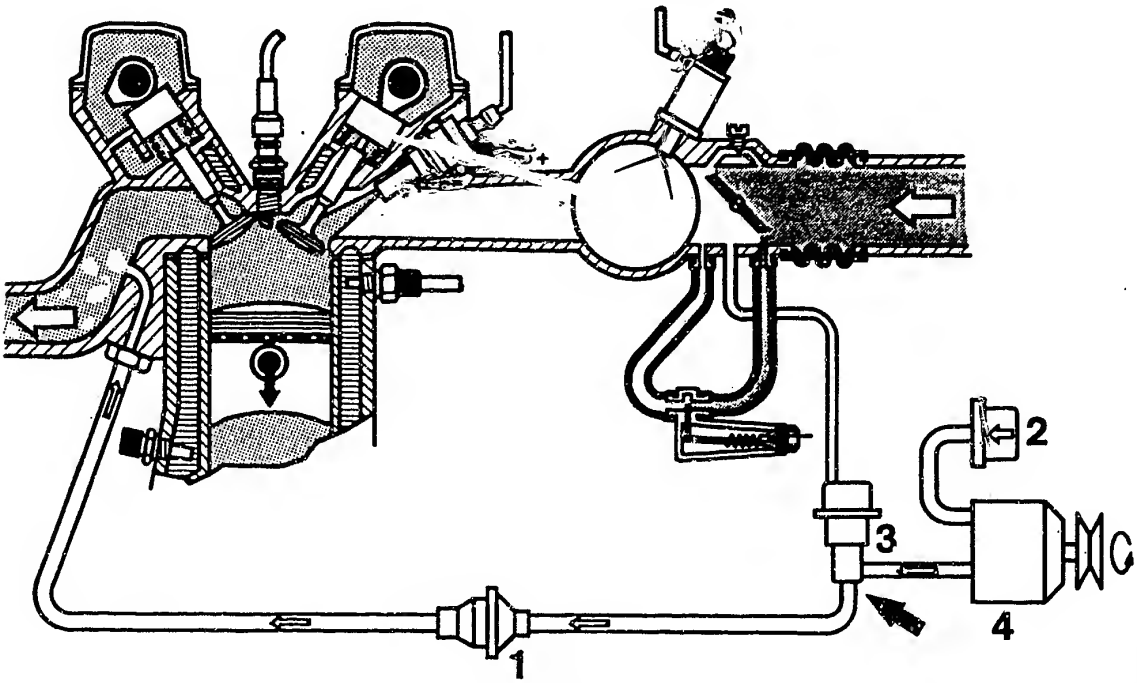
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



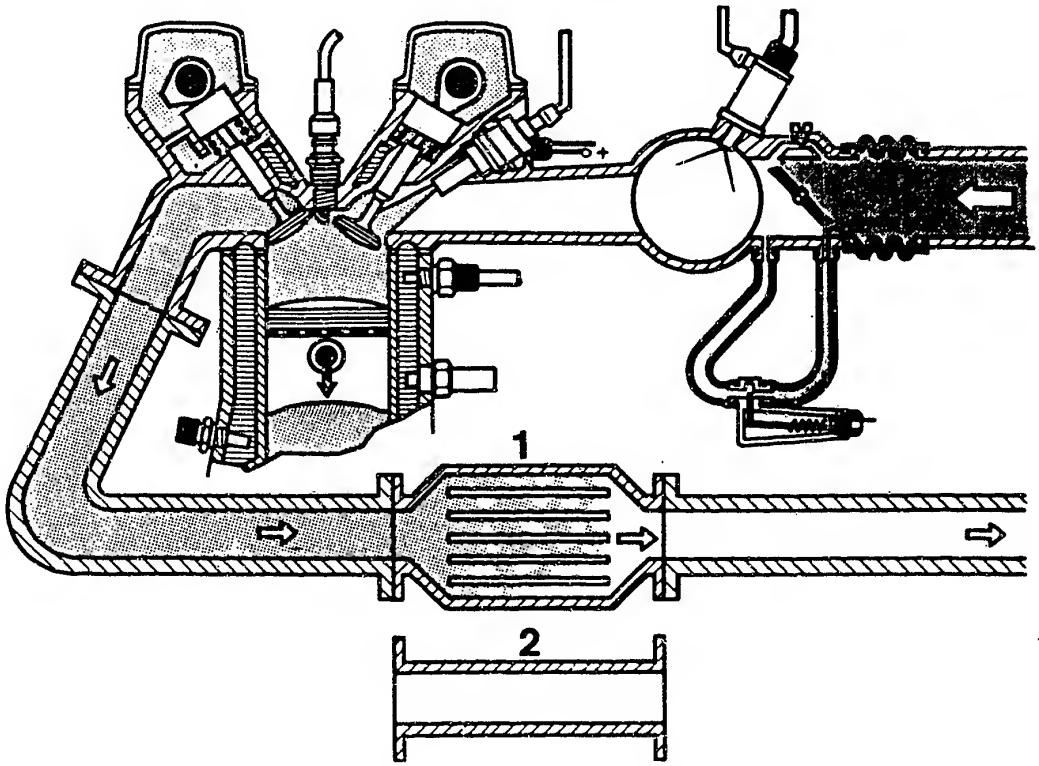
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

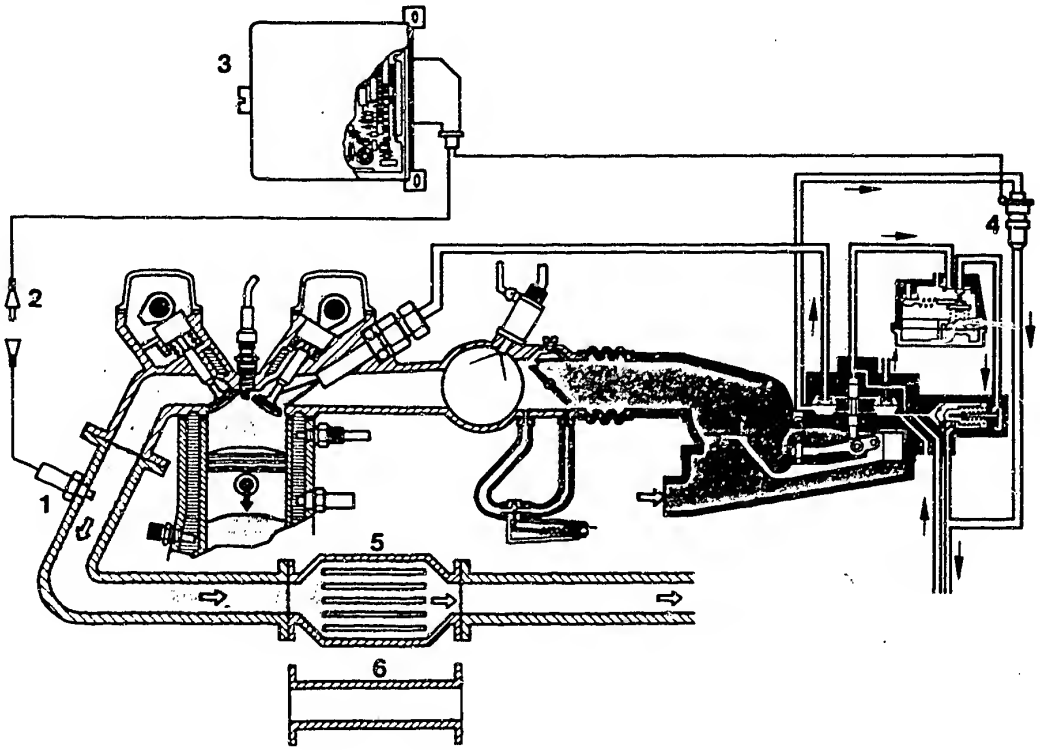
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

VDT-I-Gen. 050 En
9.1982

on vehicles fitted with Jetronic

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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After-sales Service

Motor Vehicle Service Information

VW GOLF (RABBIT) GTI, SCIROCCO GTI,
PASSAT (DASHER) GLI

VDT-I-VWW 025 En
12.1979

Hot-start difficulties
Checking the fuel accumulator

Hot-start difficulties with vehicles of the above mentioned types can be caused by faults in the fuel accumulator. The fuel accumulators concerned are 0 438 170 019 and 20 with dates of manufacture FD 924 and 925 and with works no. 050.

Fuel accumulators with date of manufacture FD 924 or 925 without works no. 050 and those with works no. 050 and with a yellow dot on the fitting side are in working order.

The accumulators which must be described as defective should be checked as follows:

Accumulators not yet fitted

Test with compressed air: Apply 4 bar pressure for approx. 5 seconds to one accumulator fitting. In doing so close off the other fitting.

Accumulators in good condition: After loosening the compressed-air connection a whistling and then a clicking noise should be heard for a few seconds.

Defective accumulators: After loosening the compressed-air connection only a whistling sound is to be heard.

Accumulators already fitted

Drive the fuel pump by bridging the electrical safety circuit (see vehicle-related test and repair instructions).
Unscrew the bleeder screw in the base of the fuel accumulator.

Using a rod as a depth measure, e.g. welding rod approx. 2 mm dia. and approx. 120 mm long, measure the depth of insertion. The fuel pump must operate for approx. 1 min. before and during the measuring procedure. The measuring rod must be inserted straight into the accumulator (if necessary remove the accumulator support).

Insertion depth: smaller than 85 mm = accumulator in working order,
larger than 92 mm = accumulator defective.

Guarantee

Claims for defective accumulators should be made as usual during the guarantee period.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

GOLF GTI, SCIROCCO GLI, JETTA GLI, VDT-I-VWW 036 En
AUDI 80 GLE WITH 1.8 l ENGINE 11.1982

Overrun fuel-cutoff -- supplementary set
New speed relay 0 280 230 108

To avoid a 1.8 l engine from cutting out due to an excessive drop in rotational speed after an overrun fuel-cutoff supplementary set 0 438 220 001, or ... 002 with speed relay 0 280 230 102 has been fitted, the points at which the speed relay switches on and off have been altered.

The switch-on speed is now 1700 min^{-1}, the switch-off speed 1500 min^{-1}. The supplementary sets will therefore be supplied as from November 1982 only with speed relay 0 280 230 108 and can also be fitted into vehicles with 1.6 l engines.

Important

Supplementary sets with speed relay 0 280 230 102 may only be fitted in vehicles with 1.6 l engine.

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Table of contents

Table of contents

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